AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XLI
Number 4

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, JULY 24, 1919

Fifteen cents a copy
Three dollars a year

JUL 2 9 1919
UNIV. OF MICH.
Engineering Library

ATWATER KENT
SCIENTIFIC IGNITION

Simple in Construction

Unfailing in Performance

FIFTEEN YEARS OF SPECIALIZATION

Fifteen years of development and research concentrated on the most vital part of the automobile have resulted in ATWATER KENT SCIENTIFIC IGNITION *as it is today.*

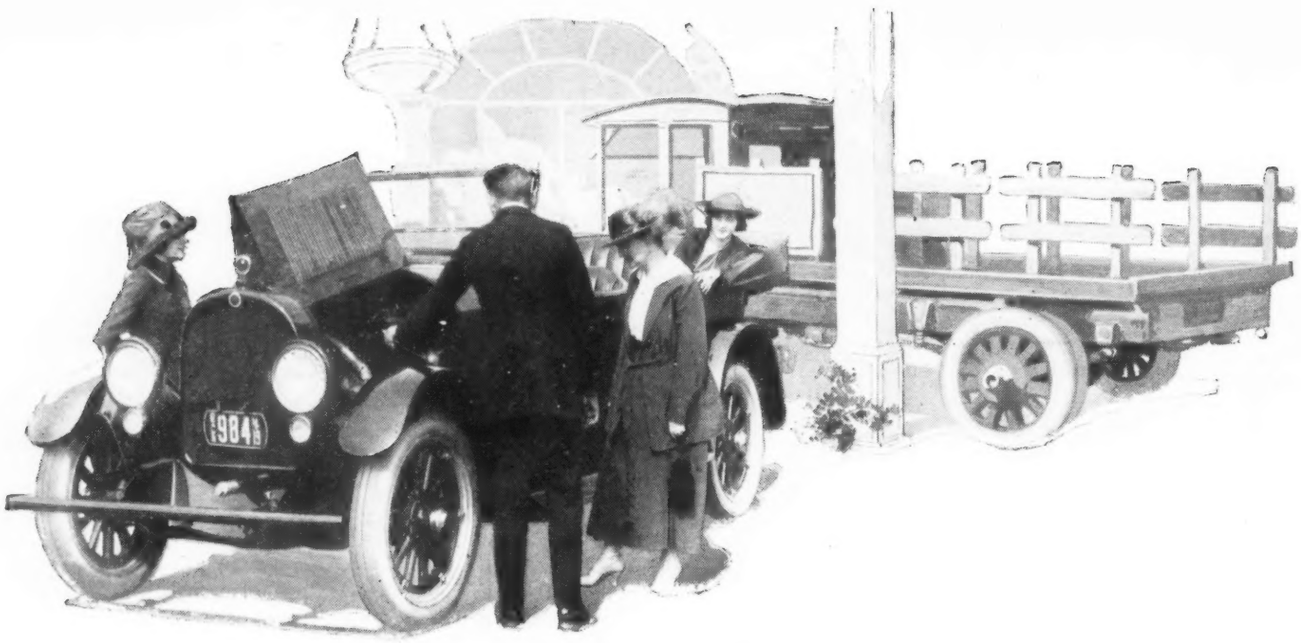
ATWATER KENT IGNITION

on your car is a sure sign of quality. It means that the builder realizes the vital importance of efficient ignition and is using the best equipment he can find, regardless of price or precedent.

ATWATER KENT MFG. WORKS *Philadelphia*

4938 STENTON AVENUE

Entered as second-class matter Jan. 2, 1903, at the post office at New York, N. Y., under the Act of March 3, 1879.



The Red Seal Continental Motor Is the Feature She Looks for First

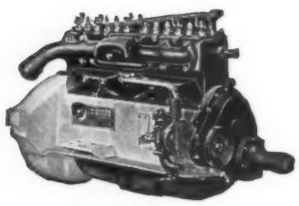
Today when economy and sureness of operation are of primary importance, the man or woman who buys an automobile gives first attention to the motor.

Unless the motor is satisfactory, all else in a motor car goes for naught. More than that, the motor's merit must be proved in advance. The buyer must be sure of its power, its speed, its silence, and above all its dependability.

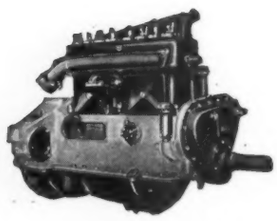
That is why the buyer most often looks first for the Red Seal Continental Motor. The Continental's record of past performance, its 100% dependability has been proved by hundreds of thousands of owners during more than a decade and a half.

Hence the Red Seal Continental Motor is the choice of more than 165 successful manufacturers of passenger cars and trucks. Upwards of 15,000 dealers base their business prosperity on Continental-powered cars. Of a large portion of the great motor vehicle industry Continental is the very foundation.

Look first, then, for the Red Seal on the motor in the car or truck you buy, and be sure of motor satisfaction.



America's Standard Passenger Car Motor. Look for the Red Seal Nameplate.



America's Standard Truck Motor. Look for the Red Seal Nameplate.

CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Michigan

Factories: Detroit-Muskegon

Largest Exclusive Motor Manufacturers in the World

Continental Motors

STANDARD POWER FOR AUTOMOBILES, TRUCKS AND TRACTORS

CONTINENTAL MOTORS — Powerful as the Nation — AMERICA'S STANDARD

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLI NEW YORK—THURSDAY, JULY 24, 1919—CHICAGO NO. 4

Constructive Plan for 25 Years of Tractor Demonstrations

Complete Failure of the Wichita Show in Both Practical Results and Attendance Is the Occasion for a Suggestion to Manufacturers and Others Interested—Bureau of Standards Proposed as Umpire to Determine Weaknesses of Apparatus

By David Beecroft

THE signal failure from a point of view of usefulness of the National Tractor demonstrations which ended here to-day has impressed on two score tractor manufacturers the unmistakable fact that the end has arrived. The trials of the last five days have been so meaningless that it is not necessary to try to explain the poor attendance.

The farmers have shown by their failure to attend that they are better judges of what a real demonstration should be than many of the manufacturers who frame the tests are.

There is little use of wasting space here dilating on how almost utterly useless the tests were. They have been poorer than two years ago and immeasurably poorer than last year, when belt tests and dynamometer drawbar tests were made.

This year's demonstrations were national in but one respect, namely, as an exhibit of makers. With one or two exceptions the makers have all been here. They have had highly creditable exhibits. All of their models have been on hand. From the presidents down, the factory and merchandising personnel has been completely represented. But stop here.

The attendance has been disappointingly sparse. One farm county agent from Kansas declared that he could get more farmers from his county for a local practical demonstration than patronized the national affair here.

There was little to bring the farmer here. He knows that tractors will plow. He also knows that a 90-minute demonstration such as this has been each day gives little opportunity to gage the stamina of the different machines. It was not necessary to bring tractors all the way to Wichita to prove they can plow. The farmers want to know how well they will stand up, and that is the very thing these demonstrations were not intended to demonstrate.

One day, I think it was Wednesday, some of the tractors had not more than 15 minutes' plowing. One farmer came all the way from Southern Oklahoma to watch the Fordson, and when he reached the field and located it, to his displeasure it had finished its plot and was through for the afternoon.

Even This Panorama Photograph Does

No, the day of such demonstrations as Wichita this week, Salina last year and Fremont two years ago has gone. They were never national from an attendance point of view. Because the majority of the tractor manufacturers attended them, they vainly imagined they were truly national. This week has dissipated the atmosphere and for the first time a score or more of the big manufacturers are agreed that the end has arrived.

Tractor demonstrations in America stand waiting at the fork in the road. One guide post sign indicates the direction to truly national demonstrations, the other sign points to regional and local demonstrations.

The best one can do is suggest. The untried lies ahead.

One thing is certain: we must have national demonstrations. The manufacturers must get together several times a year, and once at least nationally. The tractor industry, as E. J. Gittens concludes, is wandering and falling about in the gray dawn of its development. Nobody sees its clear outline as it will be revealed in the bright light of noonday. It is going to be 10, 15 and most likely 25 years before its various channels are all shaped and charted.

We stand but on the threshold of the power farming epoch. The closest co-operation of all our manufacturers is needed and this cannot be achieved so thoroughly and so speedily as by meeting in national demonstrations. As makers we must meet not only our domestic makers, but we should also meet and measure ourselves with the best makers of Canada, England, France, Italy, Belgium and other manufacturing nations. We will meet other nations in the great agricultural markets of Canada, Argentina, Brazil, South Africa and Australia, and we had better find out right at home the caliber of the other fellow. That is the cheapest place to make the discovery.

A Suggested Demonstration

Why not locate the national demonstration east of the Mississippi? Ohio has good land possibilities and is centrally located for the manufacturers. It is highly possible that by definitely deciding to hold them in Ohio that 10,000 acres of land could be obtained on some sort of demonstration agreement. The problem is big enough to lay consecutive demonstration plans for 10, 15 or 25 years.

It would not be necessary to buy 10,000 acres of land, but to negotiate some form of working agreement whereby on such a plot there would be a guaranteed acreage of crops best suited for a demonstration. Some division

J. B. BARTHOLOMEW
President of the Avery Co.

R. KEUMPEL
Tractor Eng., Gen. Ord. Corp.

W. J. BRANDON
Chief Engineer, Avery Co.

O. E. SZEKELY
Engineer, Grid Iron Grip Co.

B. C. BARTH
Eng. Kansas City branch, Rock Isl. Plow Co.

C. F. HADERER
Eng. Allis-Chalmers Mfg. Co.

Not Show Extent of Exhibit at Wichita

of crops as follows might serve as a starter:

Wheat	4,000 acres
Corn	2,000 acres
Sod	2,000 acres
Summer fallow	2,000 acres
Total	10,000 acres

The farmers resident on the property, which would preferably be in one block, would do the necessary seeding. They would have to grow, under some form of lease, the necessary crop arrangement, in return for which the recompense might be the harvesting, threshing and plowing of it. This area of wheat would provide ample plowing on stubble. The harvesting of it would afford ideal testing and demonstrating for development in harvesting combinations, such as binders, and harvesting thresher combinations. Following this the capacity of different tractors for threshing could be tested.

The 2000 acres of corn would have to be planted so as to be in good cultivation condition as soon after wheat harvesting as it would be desirable to stage the demonstrations, which would not start until after the wheat was harvested and threshed. A goodly portion of wheat harvesting could be absorbed by private tests of an official character by different manufacturers participating in the demonstrations.

It would be possible in corn cultivation to have one-half of the crop a week or so in advance of the other or to arrange for other desirable variations in order to more fully round out the usefulness of the demonstrations.

Sufficient sod for plowing could be had each year after the fourth or fifth season. Summer fallowing is suggested as another phase of the work, and no mention has been made of orchard or other classes of work that should be properly included in a real manufacturers' demonstration.

There are numerous other possibilities for usefulness in such a demonstration. Working on a continuous plan for 15 or 25 years, permanent buildings for the individual makers could be erected as well as a suitable exhibition hall for parts and accessories.

The present policy of each maker housing his exhibition in a tent with a straw, sawdust or dust floor is not conducive to the general atmosphere of the demonstration. It savors of the pre-war country fair with its rows of "pop" and "red hot" stands. It is desirable to have the farmer look upon the tractor as the refined, high-quality piece of utilitarian apparatus that it is. The old atmosphere of the self binder, which results in its remaining out all winter and having a useful life of 55 days, must not surround the tractor. A new atmosphere must be created.

The atmosphere of the motor car, the well painted garage, and the clean equipment must be built up. Permanent buildings will go far in this work.

Test stands fitted with electric dynamometers can be fitted

J. C. CONLEY
Secretary, Wichita Tractor Co.

C. A. WATSON
Mgr., Four-Drive Tractor Co.

W. C. CARSWELL
Vice-President, Carswell Mfg. Co.

E. J. POWELL
Sales Mgr., Dunham Co., Berea, O.

C. L. REISNER
Asst. Adv. Mgr., Moline Plow Co.

HENRY J. BARBOUR
Advertising Mgr., Avery Co.

A. C. JOHNSON
Desgng. Eng., Bean Spray Pump Co.

SYLVESTER C. TURKENKOPH
Sales Mgr., Moline Plow Co.

HENRY PARRETT
Sales Mgr., Parrett Tractor

E. A. WHITE
Research Department, Holt Mfg. Co., formerly with Univ. of Illinois

NEWELL SANDERS
Owner of the Newell Sanders Plow Co., and former U. S. Senator

HERBERT CHASE
Soc. of Automotive Engineers

and these would be available for use at other sessions, should manufacturers desire such. There is a motor car parallel in the Indianapolis Speedway and the Brooklands racing speedway in England. These great motor car testing tracks have made it possible to carry out engineering developments that otherwise would be impossible. They represent perhaps $1,000,000 each, and, while largely of private enterprise, have proven a great investment. Why should not the development of motorized agricultural apparatus merit a substantial investment? This is the ideal time to commence. The industry is in need of such.

Nearby hotel accommodations are a prime requisite for such a plan. If it is possible to obtain the necessary land adjacent to a large city, the closer the better. Locate it midway between two or more fairly sized cities.

Such a demonstration would essentially be a manufacturers' enterprise. The nearby farmers would attend. In fact, if properly advertised, some farmers from distant states would attend, but primarily the demonstrations are for the makers. They should be framed to constructively assist in crystallizing tractor and implement design.

Rules capable of accomplishing this would have to be framed. The object of demonstrations would be to test apparatus and disclose weaknesses, rather than to spread a camouflage skillfully intended to reveal as little as possible. All tests should be of such length as to constitute an endurance test. Accurate records compiled by official observers and disinterested impartial officials would be kept. A new base line of agricultural standards of work would be established.

The federal government might be induced to take control of a portion of the work, the Bureau of Standards being the arm of the government best fitted for it. The Bureau of Standards, during the war, did much of our aircraft development. It has aided industry in many ways. It is the great research laboratory of 105,000,000 people. Has the time not come when it should expand and perform a useful function for agriculture as well as for the development of agricultural machinery? Should it not assume responsibility for all belt and dynamometer tests?

R. E. YOUNG
Gen. Wks. Supt. and Chief Eng., American Tractor Corp.

R. T. WEST
Sales Manager, Wheat Tractor

J. E. BURNETT
Sales Mgr., Dayton Dowd Co.

G. E. KAMM
Gen. Salesman Allis-Chalmers Mfg. Co.

ED B. ARKNY
Sales Eng., Cleveland Tractor Co.

L. G. HALL
Sales Mgr., Electric Wheel Co.

H. C. BUFFINGTON
Motor Eng., Minneapolis Steel & Machinery Co.

E. E. DENNISTON
Trac. Mgr., Watson Tractor Co.

D. P. DAVIES
Vice-President in Charge of Engineering, J. I. Case T. M. Co.

A. Y. BARTHOLOMEW
Asst. Sales Mgr., Avery Co.

P. W. MORTIMER
In Charge Engine Exhibit, Minneapolis Steel & Machinery Co.

HOWARD SEELEY
Manager, Oliver Chilled Plow Wks.

Would not such an equipment afford the ideal opportunity for rational and uniform tractor ratings? It would take this knotty question out of state hands and put it into the broader federal classification.

Such a concentration of national manufacturers' demonstration activities would not interfere with regional and county demonstrations which will be required for some years to come. Tractor distributors, assisted by manufacturers, could stage regional demonstrations, and the task of county demonstrations would devolve on the dealer.

A national demonstration for the farmer is almost impossible. It is not practical in the sense that a national grain show or a national live stock show is possible. Modern agriculture is very largely so local in character as to demand local demonstrations. Such a role can be successfully filled by the regional and county demonstrations.

The conception of a permanent form of national demonstration outlined herewith is offered as a constructive suggestion to get away from the almost useless demonstrations of the past few years which have outlived their value. AUTOMOTIVE INDUSTRIES invites criticisms and suggestions on this or another plan. Now is the time to begin laying concrete plans for 1920. The industry is new. The need is great, let us co-operate on the job.

Results of the Parrett Test

WICHITA, KAN., July 19.

THE 127-hour official test of the Parrett tractor by the professors and students of the Kansas State Agricultural College was completed yesterday when the tractor completed the plowing of the 127-acre field of wheat stubble which had been previously harvested and threshed as a part of the test. The plowing with the three-plow equipment required 127 hours and 9 minutes, so approxi-

J. A. PERKINS
Asst. Fact. Sales Mgr., Minneapolis Steel & Machy. Co.

H. L. BRUBAKER
Trac. Sales Mgr., Int. Harvester

P. B. SLATER
Sales Eng., Allis-Chalmers Mfg. Co.

L. R. FOSTER
Sales Mgr., Velie Motor Corp.

R. C. FLODIN
Sales Eng., Int. Harvester

C. W. BULL
Sales Mgr., John Lauson Mfg. Co.

J. B. BARTHOLOMEW, JR. Avery Co.

A. E. HILDEBRAND Gen. Mgr. of the Demonstration

J. W. GRAY President, Gray Tractor Co.

mately one acre per hour was plowed from start to finish. The plowing was continued night and day, three shifts of workers being employed.

The total elapsed time for plowing was 151 hr., 2 min. In all 23 hr. 53 min. were lost due to stops and delays. A good portion of this was caused by a heavy rain one evening. Some of the stops were caused by troubles of the plows and others by troubles of the tractor. There were other stops for taking on gasoline, water, oil and changing plow parts. The following is a classification of the stop-losses:

Tractor time loss, 8 hr. 6½ min.; plow time loss, 2 hr. 34½ min.; weather loss, etc., 13 hr. 12 min.; total, 23 hr. 53 min.

The tractor losses were largely made up of repairing the fan belt, which developed trouble with the lacing on three or four occasions. Generally three to five minutes were needed for each repair. The sediment cup in the fuel line had to be cleaned several times, with a loss of approximately five minutes each time. There was one case of a valve sticking which caused a delay of nearly one hour. One evening the lubricant in the gear-box ran too low and the gearshifter fork stuck and had to be changed.

Other tractor delays included several adjustments of the carbureter, cleaning the air washer, cleaning contact points in the magneto, adjusting the magneto and changing one or two spark plugs. The majority of the troubles occurred at night when there was not sufficient light properly to watch the operation of the tractor.

The official report, covering the harvesting of the crop, threshing the grain and plowing, contains figures on oil consumption by the tractor which can be taken as representative of what a tractor requires. During the test the oil was drained from the crankcase approximately every 30 hours, the drainings being thrown away and fresh oil filled. The capacity of the engine was slightly over two gallons. No analysis to date has been made of the lubricant taken from the crankcase but distillation tests are to be made. At no period was the amount of oil drained from the crankcase nearly so great as the quantity put in, indicating that there was not a heavy leakage of fuel from the combustion chamber.

In the 127 hours of plowing 10.9 gal. of lubricant were added to the crankcase, this including 2 gal. of fresh oil put in at the start of the plowing.

Lubricant was added seven times after the start of the plowing.

In threshing the wheat grown on the 127 acres, 29 lb. and 10 oz. of oil were needed. Allowing 7 lb. to the gallon, this gives 4.23 gal. put in the crankcase, which included filling it at the start.

The figures show that while 29 lb. 10 oz. of oil were put in the crankcase for the harvesting operations, 21 lb. 11 oz. were drained out.

While threshing the grain, which covered a total time of 71 hr. and 57 min., 7.68 gal. of oil were required. Here again oil was added at four periods after the start and during the threshing test the oil was drained out three times.

Monel Metal

A DEPOSIT of copper ore was discovered at a point near Sudbury, Ontario, in 1884, during the construction of the Canadian Pacific Railroad. This deposit was opened on a commercial scale, but as the mining progressed, it was found that what had been discovered was not a copper deposit, but one containing both copper and nickel. Methods of separation and refining were developed and from this chance discovery originated the great nickel industry of this continent.

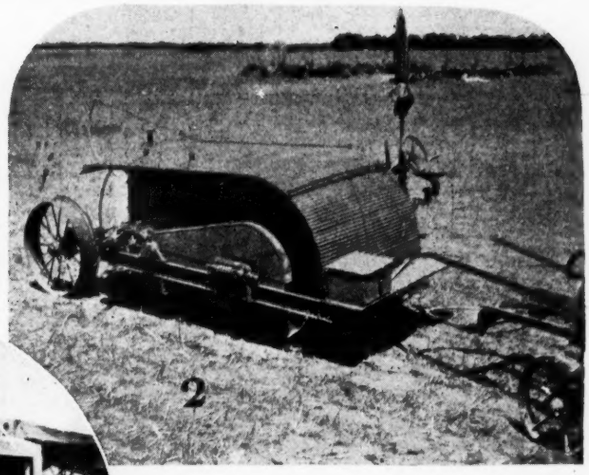
About 1905 it was conceived that for certain purposes it was not necessary to separate the nickel and copper, but that an alloy could be produced direct from this ore without separation. This was soon proved to be both technically and commercially possible, and the experimental production of Monel metal was begun. Investigation of the resulting metal showed that there had been produced an alloy differing in kind from any previously known. In appearance it resembled nickel. In its tensile properties, it was more nearly allied to the steels. As might be expected from its composition, its resistance to corrosion was excellent. On account of these properties, it soon found a market in places where both non-corrodibility and strength were required. Further knowledge of its properties and improvements in the methods of manufacture led to wider use, and this use to further knowledge.

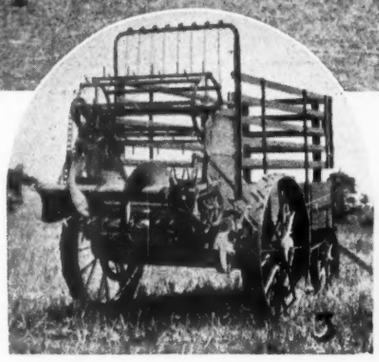
Technically, Monel metal is an alloy of nickel and copper, containing about 67 per cent nickel, 28 per cent copper, and 5 per cent of other elements. This remaining 5 per cent consists partly of iron from the original ore and partly of manganese, silicon, and carbon introduced in the process of refining. It contains no zinc or aluminum. The alloy can be machined, forged, soldered and welded, both electrically and by the acetylene torch. In the automobile industry it is used for float valves in carburetors because it combines hardness with non-corrodibility.

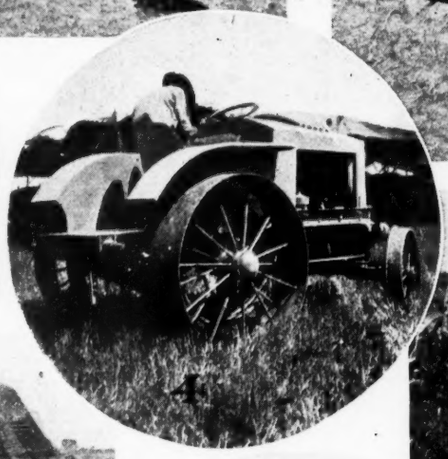
Britain to Dispose of Motorcycles

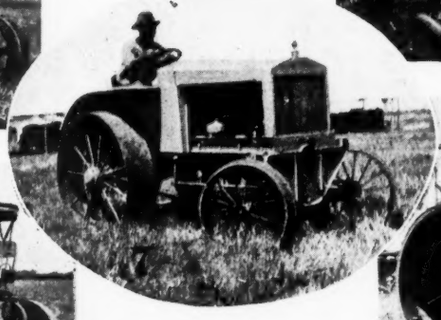
A SPECIAL concession has been granted by the British Government to the War Motors Association by which ex-motorcycle despatch riders who have served as such in any branch of the Services, are to be given first refusal of a large number of surplus Government motorcycles. The only condition attached to the offer is that the motorcycles shall not be re-sold within six months. The following machines are available immediately: Several hundred new Douglas motorcycles, in crates, at from $300 to $350; a large number of repaired Douglas motorcycles, $200 to $250; and a quantity of repairable machines, at various prices.

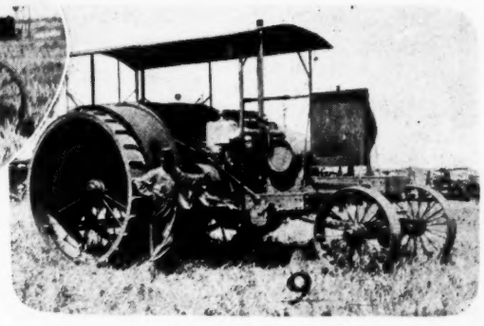
Some of the Scenes in the Fields

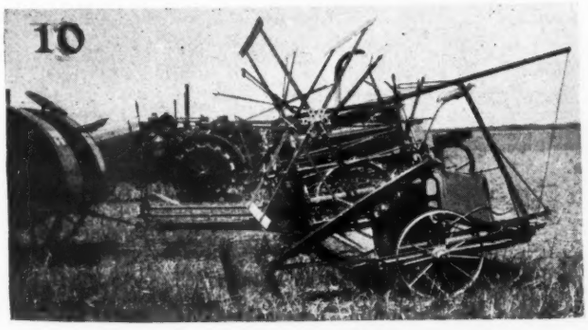


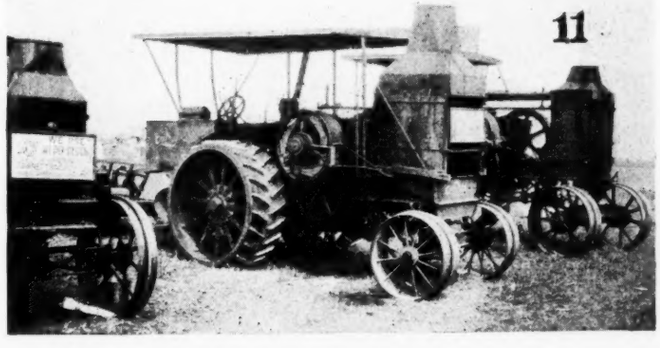




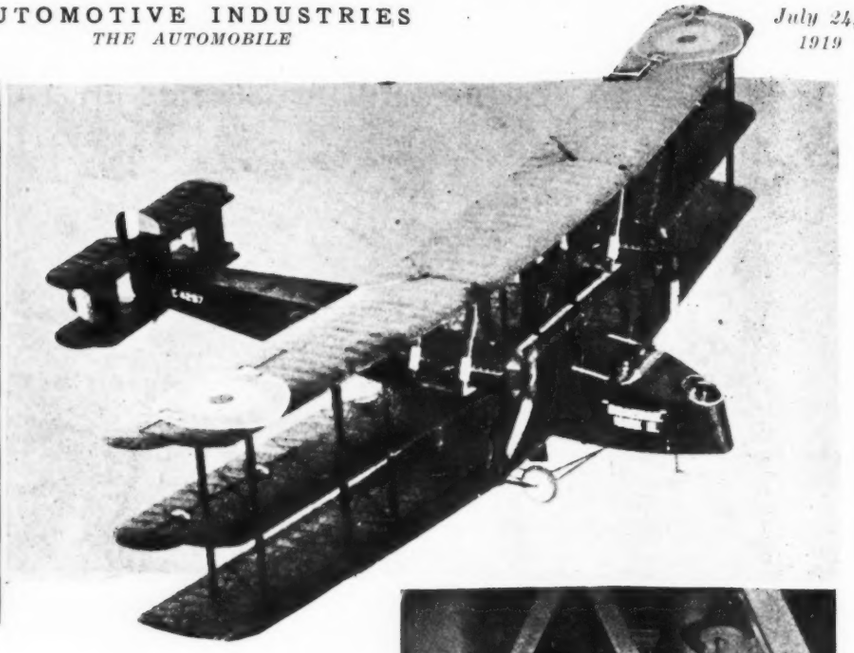








No. 1—Lacrosse Power Lift Tractor drill. No. 2—All mechanism in Gray tractor is well covered. No. 3—I. H. C. manure and straw spreader. No. 4—Rear quarter view of the Yankee. No. 5—Bean in a corn-field. No. 6—Wolverine looks more like an armored car. No. 7—Front quarter view of the Yankee. No. 8—The largest of these Holts was rated at 10 tons. No. 9—The Russell was probably the largest in the field. No. 10—McCormick grain binder. No. 11—No. 1 Oil Pull tractor, 10 years old and still able to pull five 14-inch bottoms



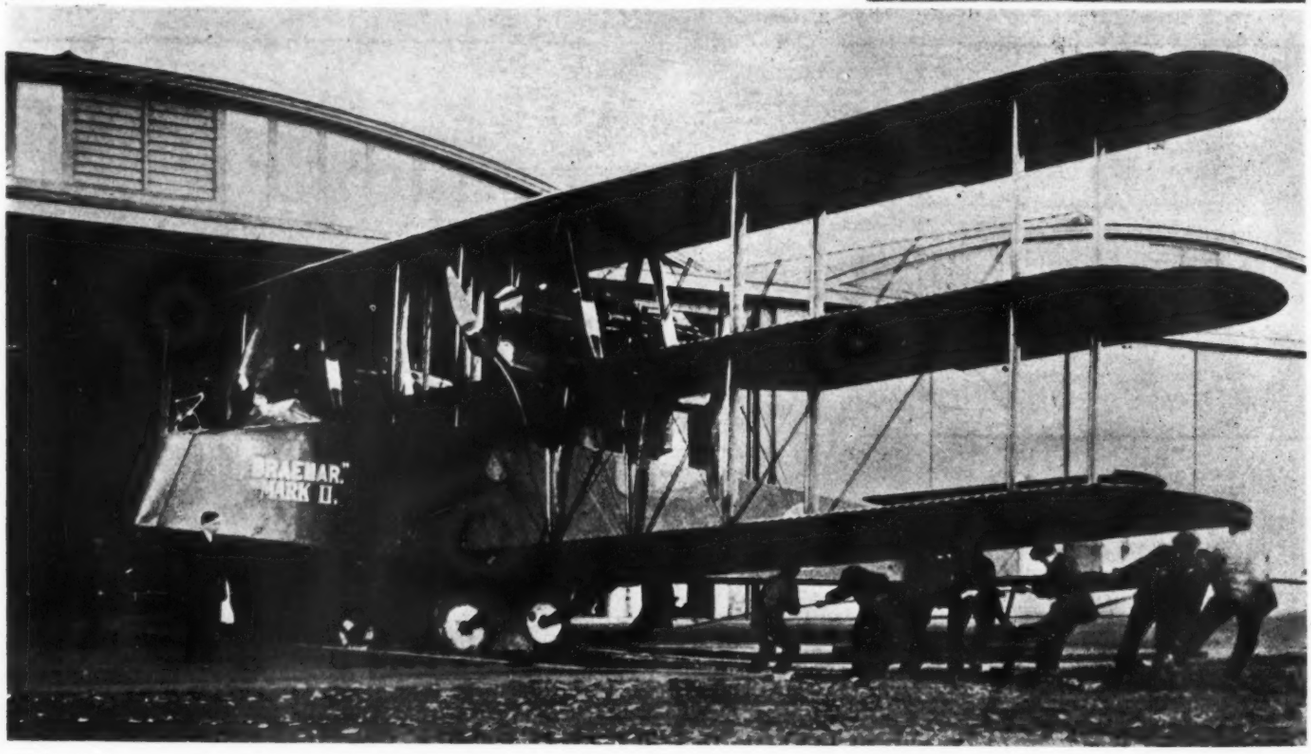
Airplane With a Promenade Deck

THIS Bristol triplane in England is being exploited as a de luxe air travel machine. The promenade deck, as shown at the right, probably will not impress those who think of promenade decks on ocean liners, but this is said to be the first heavier than air machine which permitted any freedom of movement on the part of the passengers.

At the top of the page are shown the triplane in flight and a photograph showing the pilot in his working location. The promenade deck is for passengers and is used by members of the crew.

Below is a picture of the triplane being removed from its hangar.

Keystone Photos



Valve-in-Head and "L" Engines Built of Common Parts

Twin six cylinder models, although of different design, include the same crankcase, crankshaft, connecting rods, pistons, oil pumps and many small parts. Oil distributing pipes are cast in crankcase, hence they cannot annoy the user by coming loose. Novel arrangements for hot spots in manifold.

By P. M. Heldt.

ELIMINATION of outside piping and the use in common of many parts for valve-in-the-head and "L" head cylinder type engines are features of the program of the Trego Motors Corp. in building two models for six cylinder passenger car engines that are enough alike to be recognized as twins although of different complexion.

As to the piping, only the pipe leading to the oil pressure gage on the dash is exposed. All of the oil distributing pipes are cast in the crankcase, and consequently are eliminated as far as coming loose is concerned.

Both types of engines are of 3½-in. bore by 5-in. stroke and the interchangeable parts include both halves of the crankcase, the crankshaft, connecting rods, pistons, oil pumps, and numerous minor parts. The "L" head is the lighter of the two models, weighing in the dry state 567 lb., while the valve-in-head model weighs 604.9 lb. dry. We will first describe the "L" head model, and at the end of this description refer to the points in which the valve-in-head model differs.

The "L" Head Model

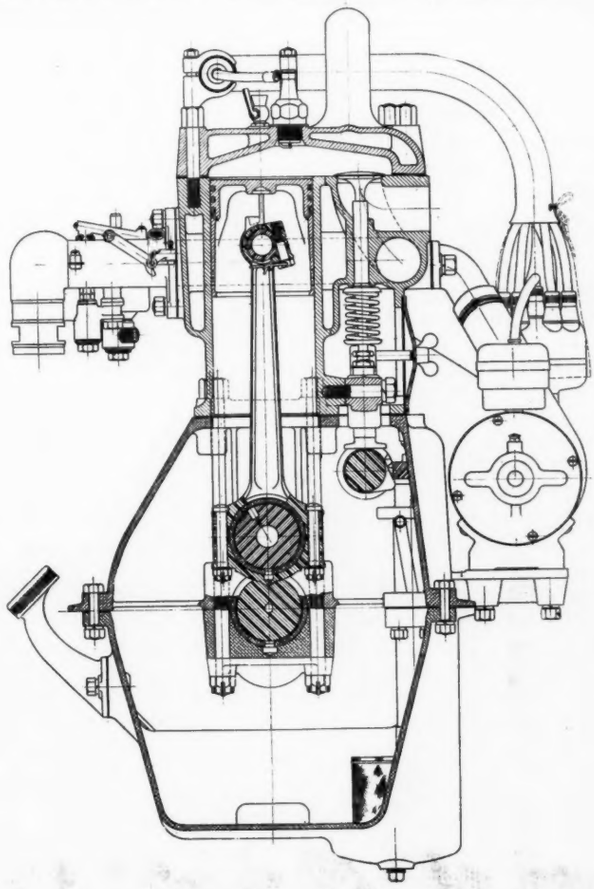
The six cylinders are cast in a block, with an open space between the third and fourth cylinders through which the hot air pipe extends from the exhaust manifold to the carbureter. The cylinder head is cast separately, and is secured to the cylinder block by means of twenty-four 7/16-in. studs of chrome nickel steel. There is a separate connection from each exhaust valve, and the exhaust passages are made as short and direct as possible.

The inlet manifold is cast in the cylinder block, extending the entire length of the valve pocket, and debouches at the opposite side of the block between the third and fourth cylinders. In this way hot spots are formed wherever the inlet passage comes close to the exhaust passages. Communication between the cylinder and head water spaces is assured by twelve round and one oblong holes. With such a large number of communicating passages, evenly distributed, there is absolutely no possibility of any steam forming in the jacket. A copper-asbestos gasket is placed between the cylinder block and head.

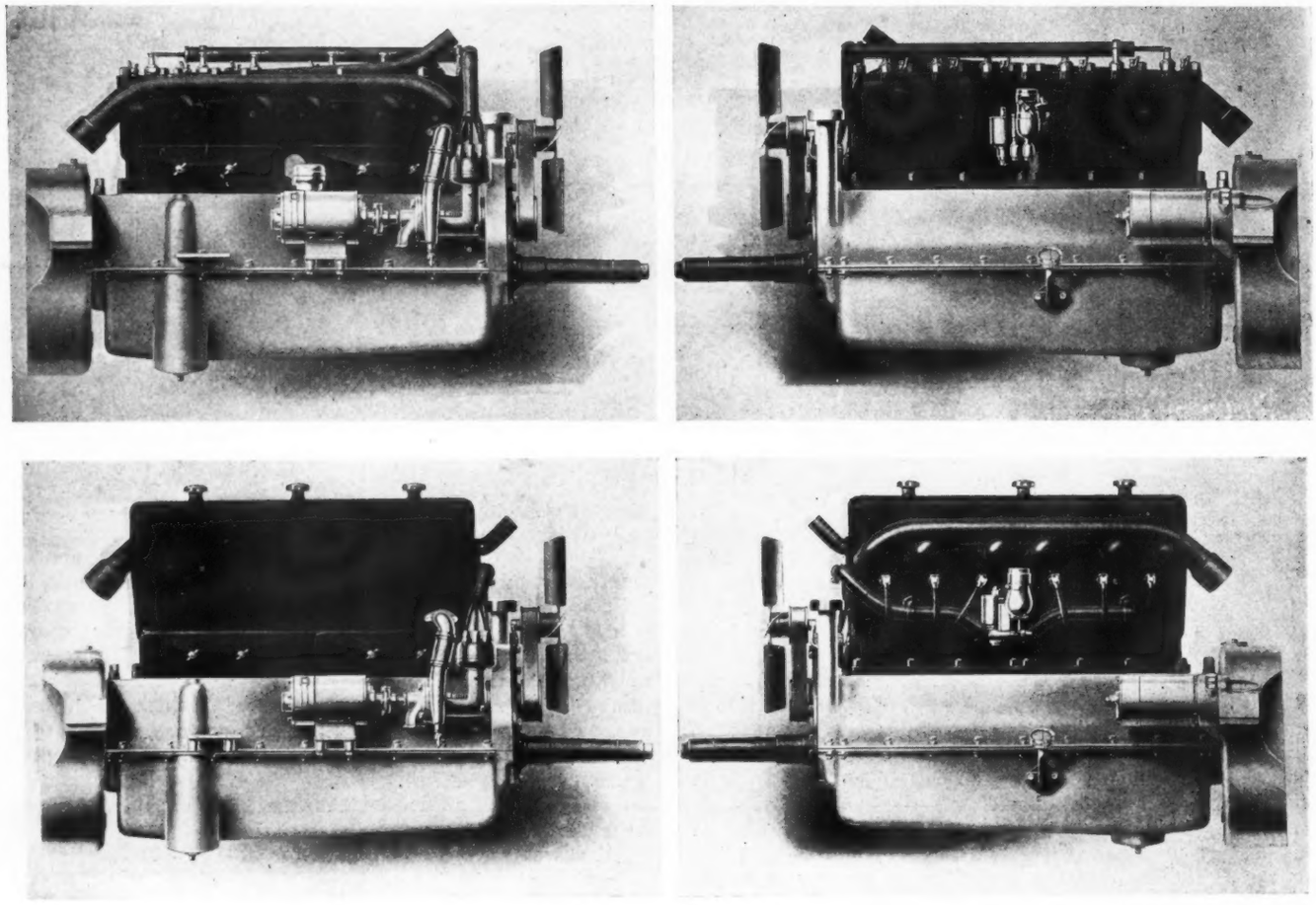
The cylinder hold-down studs are provided with nuts which have a thread length one and one-half times the stud diameter. Variation in the lead of the threads in the nut and on the stud respectively is said to give a tight fit and prevent the nuts from coming loose. The crankcase is cast in aluminum and is divided into upper and lower halves, all of the main crankshaft bearings being, of course, carried on the upper half. The main bearing studs screw into the aluminum of the upper half, for a length of about 1½ in., beyond which they are reduced in diameter from ½ to 7/16 in., and they are extended to also form cylinder holding-down bolts. The caps for the main bearings are of aluminum and are reinforced by T section steel forgings.

Six push rod guides are formed in one casting, which is held to the cylinder block by means of three studs screwing into bosses formed on the cylinder barrels. This push rod guide casting is formed with two lugs into which are screwed the valve cover studs. Two of these push rod guide castings are, of course, used, each containing the pushrods for three inlet and three exhaust valves. There are large oblong openings in the top of the crankchamber, and the push rod guide castings can be readily inserted and removed.

All valves have a clear diameter of 1½ in.; the lift is



Cross section of "L"-head type



Above—"L"-head type. Below—Valve-head type

5/16 in. for the intake and 3/8 in. for the exhaust valves. Valve stems are 5/16 in. in diameter, and have a 4-in. bearing in their guides. The guides are made of cast iron, and are pressed into the cylinder block from below, being held in place by the pressure of the valve springs. One of the features of design to which special attention is called is that the valve stem guides are thoroughly water-jacketed, so that the stems are well cooled, and it has been found possible to adjust the valves to a clearance of 0.001 in. when cold, without trouble from the valve failing to seat when the engine is hot. The valve spring pressure ranges from 35 lb. when the valves are closed to 47 lb. when they are fully opened.

Mushroom type cam followers are used. The push rods have an outside diameter of 3/4 in., are drilled out for lightness, and are provided with adjusting screw and checknut. Washers of considerable diameter are placed on the push rod below the checknut, which serve merely to prevent the pushrods from dropping out of the guide when the latter is handled in the shop.

The combustion chamber surface of the cylinder head casting is thoroughly cleaned, so as to present as smooth a surface to the burning gases as possible. The spark plug boss is located near the center of the combustion chamber, and takes an S. A. E. standard 7/8-in. spark plug with normal length of thread. The spark plug hole is not cupped on top, and yet the normal length of spark plug thread extends entirely through the boss, and brings the spark plug terminals into the right position for the best results. The spark plugs are thoroughly water-cooled. Twenty-four studs are used to hold the cylinder heads to the cylinder blocks. These studs are made of chrome nickel steel and are 7/16 in. in diameter. Of these studs, six extend down through the center between the cylinders. The priming cock bosses are located over the pistons, so that they can be used for timing. The water outlet is cast integral with the head casting, and has an internal diameter of 1 1/4 in., the same as the water inlet.

Cast iron pistons are used, and by careful design their weight has been brought down to a very low limit. The weight of the bare pistons is 1.90 lb. Three compression rings are fitted to the upper end of the pistons, and at the bottom of the third ring there is a triangular section oil groove, with oil return holes to the interior of the piston. Two rather deep scraper oil grooves are turned into the piston skirt. The piston pins, which are made from steel tubing, are carbonized and hardened on the outside, but are left soft on the inside. They are made from No. 1020 S. A. E. steel, are 1 3/32 in. in diameter, 3/4 in. inside diameter and have a bearing length of 2 in. The piston pin is fastened by a clamp screw in the upper end of the connecting rod, and bears directly on the cast iron of the piston bosses. The clamp screw is locked by being wired to the connecting rod, which latter has a hole drilled through its web for the purpose.

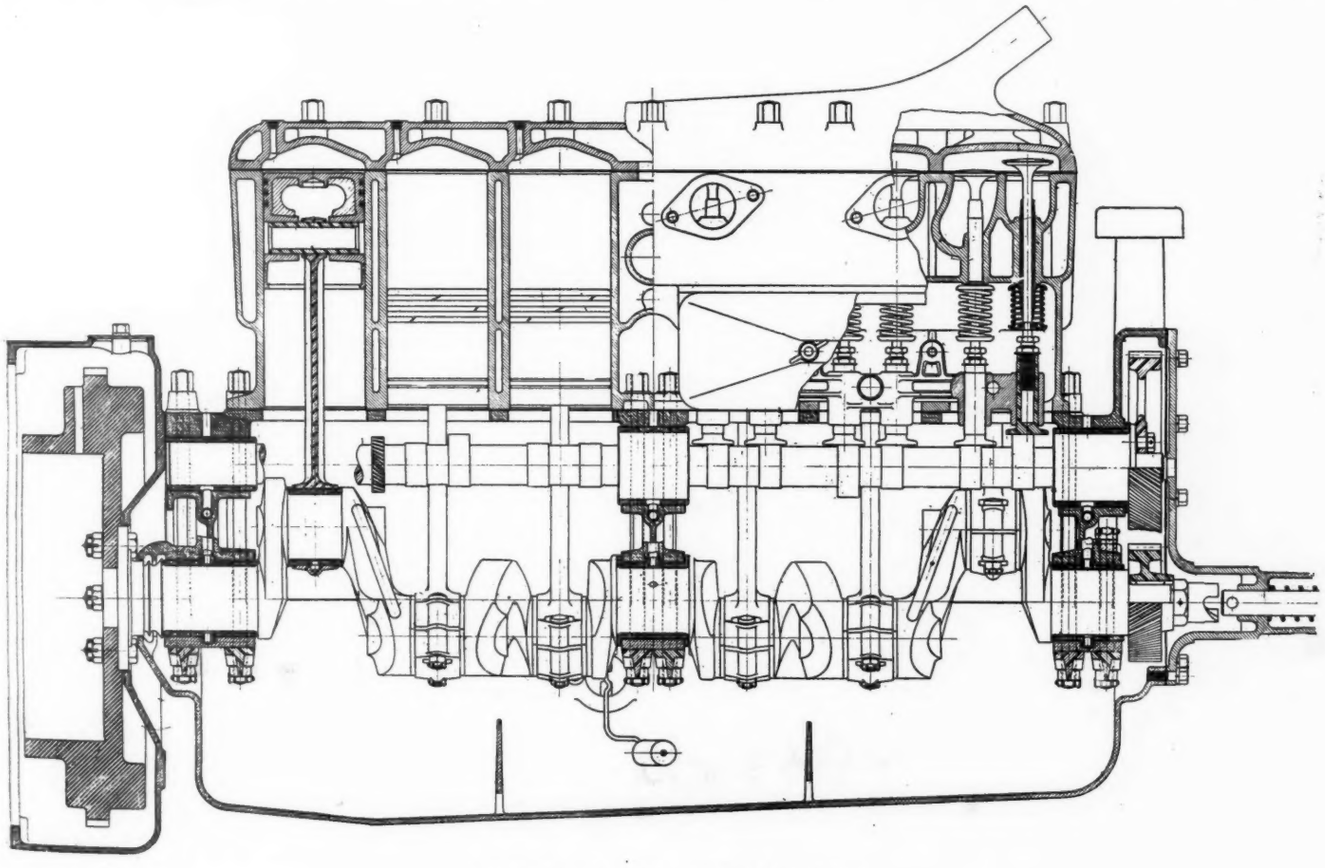
The connecting rod is the usual I-section drop forging. In manufacturing it, the bores at both ends are finished and the holes for the connecting rod cap bolts are drilled before the cap is detached by means of 1/8-in. saw. When the sawing operation is completed, that portion of the bearing integral with the rod forms a complete semicircle, and the material removed by the saw is replaced by a 1/8-in. solid brass shim which extends only to the outside of the bearing bushing, thus insuring an unbroken bearing

surface for the crankpins. There are no oil grooves in the crankpin bearings. The total weight of the connecting rod is 3.44 lb., this including the rod proper, piston pin, lockscrew, babbitt lined bearing, cap bolts, nuts and shims. All of the piston and connecting rods are weighed to insure good balance and the weights are held within limits of plus and minus one ounce.

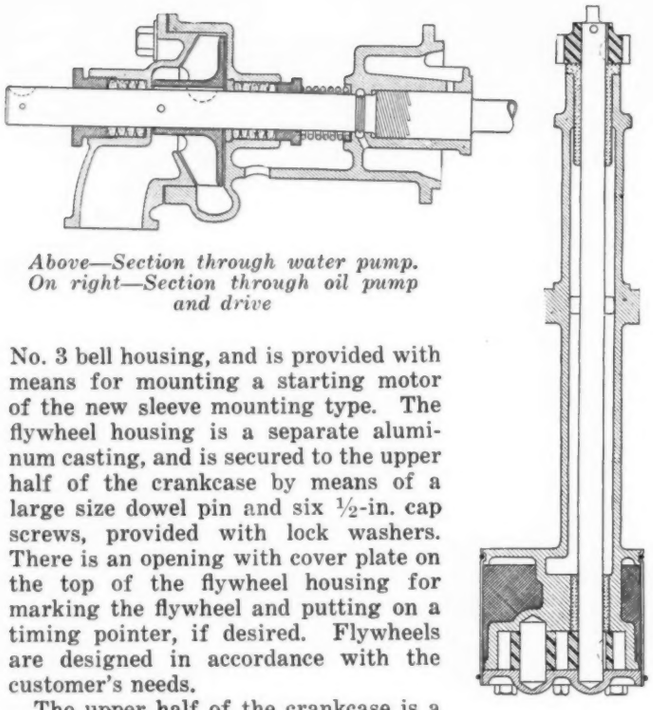
A three-bearing crankshaft is used, all of whose journals are 2¼ in. in diameter. The crankpin bearings are 1⅞ in. in length, and the lengths of the main bearings (front to rear) are as follows: 2⅜ in., 2⅜ in., 3⅛ in. A ⅞-in. hole is drilled through each crankpin concentric with its axis, and there is a radial delivery hole in each crankpin which is ¼ in. in diameter at its outer end, but is reduced at its inner end so as to prevent the bearings next to the main bearings from robbing the center crankpin bearings (Nos. 2 and 5). The oil is fed under pressure to each of the three main crank bearings, and from these bearings it is conducted through passages in the crankshaft and through oil tubes secured to same to the three crankpin bearings between adjacent main bearings. The short, straight crankarms adjacent to each main bearing have holes drilled through them which communicate with the axial holes in the main journals. Brass tubes of ⅜-in. outside diameter and ¼-in. bore are inserted into the ends of the long crankarms, the ends of the tubes extending into the crankpin oil holes and having their ends swedged over. Where the oil tubes enter the crankarms, they are peened and sweated, the peening being depended upon to hold the tubes in place, and the sweating to insure an oil-tight joint. Hence, there is absolutely no strain on the sweating. At the rear end of the crankshaft there are double oil slingers, which extend into grooves machined in the upper and lower halves of the crankcase. An integral flywheel flange is formed at the rear end of the crankshaft, 5 in. in outside diameter, with a bolt hole circle 4⅛ in. in diameter. Holes are drilled in this flange for six ½-in. bolts. The cam gear pinion, which is made of No. 1035 steel, is driven by a Woodruff key and is held in position by a nut which also carries the starting crank ratchet. This latter is case hardened. The camshaft gears are cut with helical teeth of approximately 30 deg. spiral angle and 1¼-in. width of face. The driven gear is made of cast iron, and is bolted to a flange on the camshaft by means of four bolts. The bolt holes in the gear hub are elongated to such an extent that it is possible to make an angular adjustment equivalent to one tooth. This permits of changing the timing by merely loosening the four bolts and shifting the camshaft gear angularly on the camshaft.

The thrust due to the helical gears is taken up on hardened buttons, in the end of the camshaft and in the camgear housing cover respectively, the button in the end of the camshaft being backed up by coiled spring. The camshaft is of very substantial size, being 1⅜ in. in diameter and supported in the upper half of the crankcase in three bearings, the dimensions of the latter (front to rear) being as follows: 2⅜ x 2⅝ in., 2 11/32 x 2 7/16 in. and 1⅝ x 2 in. Die cast babbitt bushings are used in the camshaft bearings. The cams have a base circle of 1½ in. and are 1 in. wide. They are offset sideways with relation to the axis of the push rod, so as to cause the latter to slowly revolve in their guides and thus distribute the wear.

A cast iron gear case cover is bolted to the aluminum gear case formed integral with the crankcase upper half. This cover forms the front support for the engine, as well as the starting crank support. A cylindrical portion of this cover is turned off smooth, and is designed to form a trunnion support on a cross bar. Rear supports are cast on the flywheel housing. The latter is the S. A. E. standard



Longitudinal section of "L"-head type

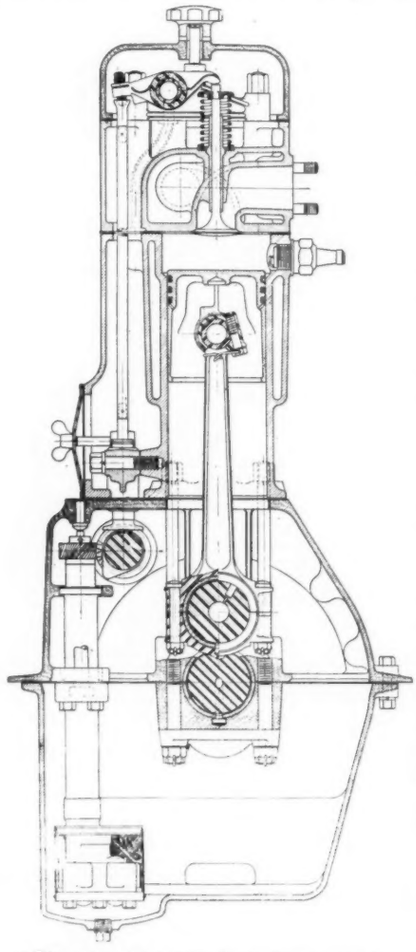


Above—Section through water pump. On right—Section through oil pump and drive

No. 3 bell housing, and is provided with means for mounting a starting motor of the new sleeve mounting type. The flywheel housing is a separate aluminum casting, and is secured to the upper half of the crankcase by means of a large size dowel pin and six ½-in. cap screws, provided with lock washers. There is an opening with cover plate on the top of the flywheel housing for marking the flywheel and putting on a timing pointer, if desired. Flywheels are designed in accordance with the customer's needs.

The upper half of the crankcase is a straight, aluminum casting which serves mainly as a spacer, as the main bearing studs extend all the way through this half of the crankcase, and also form cylinder hold-down bolts. The crankcase is substantially ribbed, however, and the ribs are brought very close to the through bolts. The breather and oil filler is cast integral with the upper half of the case, at the forward end of the engine, the usual baffles being cast in the breather to prevent loss of oil. A pressed steel cover with welded in pin is used in connection with this breather. The breather pipe also forms the fan bracket, being drilled with holes through its walls parallel with the crankshaft axis. A crank shaped fan stud is provided, which permits of adjusting the belt tension by rotating it around its support in the breather tube, and clamping it in place. While there are absolutely no oil grooves in the crankpin bearings, circumferential grooves are cut in the main bearings in line with the oil feed hole. The bottom half of the crankcase is a plain aluminum shell, with two baffles, and with a boss to which the oil gage is bolted. The flange of the upper half of the crankcase extends out beyond the flange of the lower half, forming a means for securing a dust shield.

As already pointed out, the pressure system of lubrication is employed in both engines. Oil is forced to the bearings by means of a gear pump, which is located at the bottom of the crankcase. This is driven through a vertical shaft and a pair of helical gears from the camshaft, the driven gear of the pair being made of bronze. The bearing is such that the oil pump turns at 0.7 time the speed of the crankshaft.



Cross section of valve-in-head type

The oil pump delivers into a housing surrounding its driving shaft, from the upper end of which extend two tubes, one to the rear main bearing, the other to the front and center bearings. A branch from the oil supply to each main bearing leads to the corresponding camshaft bearing, so that these bearings also have pressure lubrication. An oil relief valve is mounted on the outside of the crankcase on the valve side at the rear end, and any oil that is passed by this relief valve is delivered into the cam gear case at the forward end, whence it returns to the crankcase sump.

The accessories drive shaft is driven at one and one-half times crankshaft speed. This shaft in front of the gear housing carries the fan pulley, and directly in back of the gear housing it carries a helical gear for driving the ignition distributor, which latter is mounted together with the water pump. This water pump is of the conventional centrifugal type. Its rear stuffing box is provided with a nut, while the gland of the front stuffing box is held in place by means of a coiled spring, hence is self adjusting.

Two pads are cast integral with the upper half of the crankcase, the forward one for a generator (S. A. E. standard mounting), and the rear one for a magneto or a tire pump, the latter requiring the use of a spacer. The water inlet to the cylinder jacket is directly above the water pump, and the connections are therefore very short.

Valve-in-Head Model

In the valve-in-head model there is an oil passage from the center crankshaft main bearing up to the cylinder head into the center bracket for the rock lever shaft. This rock lever shaft is in two halves, is hollow, and is mounted in the brackets with dowels so that it cannot turn in them. The rocker arms are bronze-bushed, their bearings being unusually liberal in size, viz., 15/16 in. in diameter by 1¼ in. in length.

The rock lever shafts are hardened and ground, thus affording an excellent bearing surface. Oil passes through a hole drilled through the rock lever and squirts into a cup at the upper end of the tappet rod. These tappet rods are enclosed, and an aluminum cover encloses the entire valve mechanism on top of the cylinder head.

This aluminum cover is held in place by means of three nuts, which have ventilating slots cut in their under surface, the holes in the cover where it passes over the holding-down studs being sufficiently large to insure free ventilation. These provisions for ventilating the valve chamber not only insure that the oil mist from the crankcase passes up into this chamber, but they also cause all dead gases to be removed from the valve chamber as soon as the engine is stopped, thereby preventing rusting.

In this model the carbureter and exhaust manifold are on the same side of the cylinder block, and the hot-air connection therefore is short and of neat appearance. The spark plugs are located on the side of the cylinder blocks, and the cables are carried from the ignition distributor to the spark plug through a cable tube.

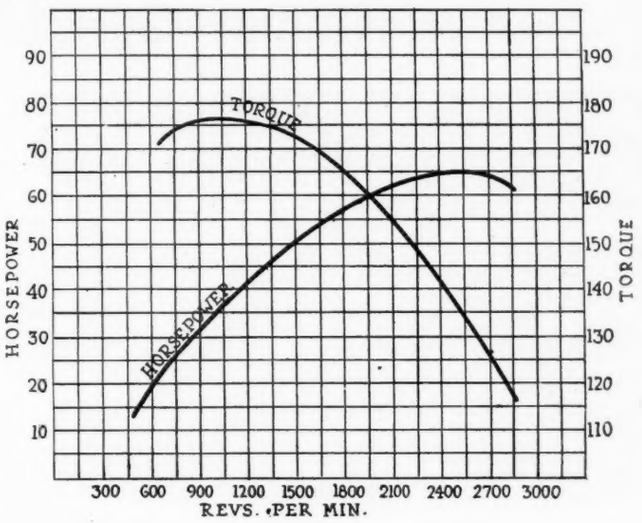
The end of the tube over the distributor is flared out, and the upper end of a pantasote boot enclosing the dis-

tributor enters the tube and is held in place by means of a cord, the ends of which pass out through two holes drilled in the wall of the tube. On the valve-in-head model the cable tube brackets are located on the side of the cylinder block, and the studs for holding the brackets in place are formed on cylinder core plugs. On the "L" head model, on the other hand, the cable tube brackets are on top of the cylinders.

The rocker shaft is supported by seven brackets, which are held in place by the cylinder head studs. Three of these brackets carry studs for holding down the aluminum cover.

Combustible mixture enters the side of the cylinder block, passes upward through the cylinder block and into the cylinder head, where it is distributed through a longitudinal passage cast in the cylinder head. The water jackets of the cylinder block and the cylinder head castings communicate through 22 round holes, and these are so spaced that perfect circulation is assured around the spark plugs.

The cylinders and heads of these engines are enameled in gray. The crankcase is given a natural aluminum finish, and accessories, such as priming cocks, etc., are either nickeled or polished, at the option of the purchaser.



As the above power curve shows, the engine develops a maximum of 65 hp. at 2500 r.p.m.

New Light Piston Alloy

A NEW alloy whose chief ingredient is magnesium and which is produced from magnesium chloride, a by-product of the natural brine is used in the manufacture of numerous chemicals.

Magnesium is the lightest commercial metal, having a specific gravity 1.74, as compared with 2.6 for aluminum, 7.8 for iron, 8.8 for copper, 11.4 for lead. It is produced by the electrolysis of fused magnesium chloride, which is obtained from a natural brine pumped in large quantities.

The pure metal has considerable tensile strength, varying from 15,000 to 20,000 lb. per sq. in. with the manner in which it is cast. It is ductile and malleable, can be rolled, drawn and forged. It has a high heat and electrical conductivity, the heat conductivity being 0.343 calorie per second per centimeter cube as compared with 0.924 for copper and 0.147 for iron, the electrical conductivity being 33.7, as compaed with 94.0 for copper. When the very low specific gravity of magnesium is considered, it is evident that weight for weight it is as strong as steel and has a greater conductivity for heat and electricity than copper.

Magnesium forms alloys readily with the common non-ferrous metals. Dow-Metal is an alloy, which has been developed for casting purposes such as for pistons by the Dow Chemical Co., and they believe it to be the best material for pistons now manufactured. It may be cast either in sand or metal molds. It has a fine grain, is strong and rigid, but less brittle than cast aluminum. The yield point is from 12,000 to 14,000 lb. per sq. in., the ultimate strength is 15,000-18,000 lb. per sq. in. The temperature of the metal when poured, as well as the temperature of the mold used for the casting, is very important. It is specially intended for use in pistons where its strength, lightness, low co-efficient of expansion, better machining qualities and high heat conductivity are valuable qualities. It has the added valuable property that it does not score a cast-iron cylinder.

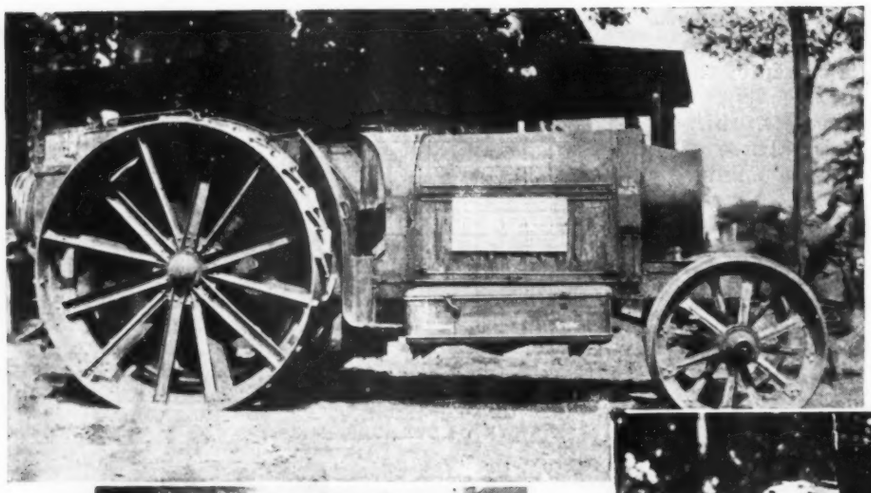
The machining qualities of magnesium or Dow-Metal are superior to those of the other light metals, inasmuch as the lathe can be run at its highest speed, using no cutting compound whatsoever, and the tool shows very little wear. Dow-Metal with a Brinell hardness of 45 as compared with aluminum alloys with a Brinell hardness of 90 machines far more readily and does not tear or gum up the tool in machining.

Prior to the war practically all magnesium was imported from Germany and used almost exclusively as a deoxidizing agent in non-ferrous work. Its manufacture in the United States dates back to about three years ago. To summarize: The advantages claimed for Dow-Metal as compared with aluminum alloys used for piston material are a lower co-efficient of expansion, a greater tensile strength, greater conductivity of heat, better machining qualities, much less abrasive effect when used as piston in a cast-iron cylinder and less weight. It is made by the Dow Chemical Co.

Aneroid Barometers

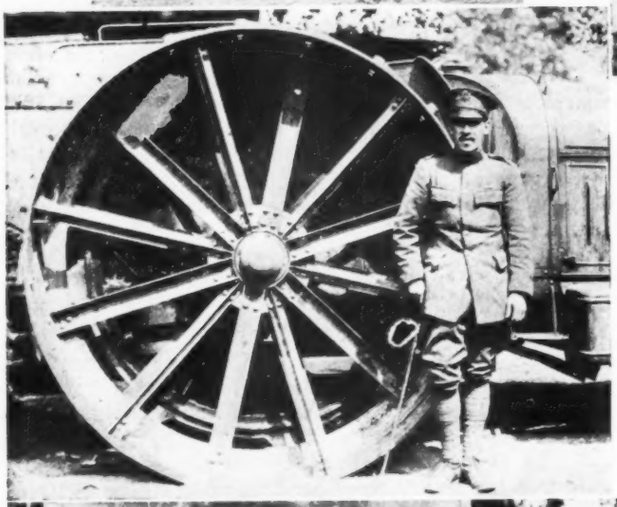
A DISCUSSION of means to diminish or remove the disturbing effects of elastic hysteresis of the membranes is published by E. Warburg and W. Heuse, in *Zeitschrift für Instrumentenkunde.* The first consideration, is to choose a suitable membrane. A material showing less hysteresis than hard German silver as used in aneroids could not be found, but an improvement can be effected by reducing the thickness of the membrane. The thickness was reduced from the usual 0.2 mm. to 0.05 mm. The second improvement was to use a strong spring. The sensitiveness is restored by employing a pointer with greater magnification, troubles due to friction being avoided by means of a special arrangement for producing vibration. Thirdly, an aneroid box is used, in which both the top and bottom respond to the vibrations of pressure. In this way the deflections to be read can be doubled. Although with the stronger spring employed the sensitiveness is not increased by any means to double, yet the effect of hysteresis is halved. By applying these three improvements it is possible to make aneroids for which the differences of readings with increasing and diminishing pressure can be reduced to 2 mm. for pressures between 760 and 410 mm.

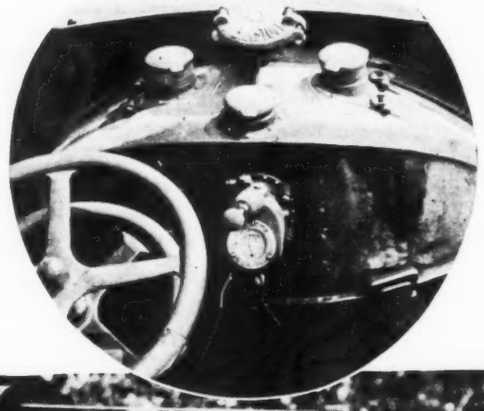
4-Cylinder—German Army Tractors Exhibited

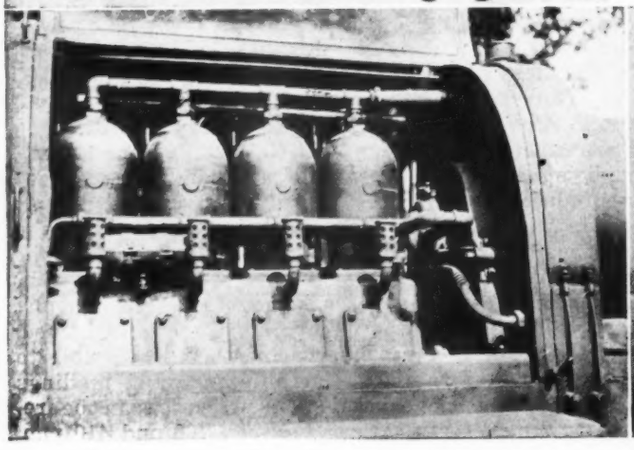


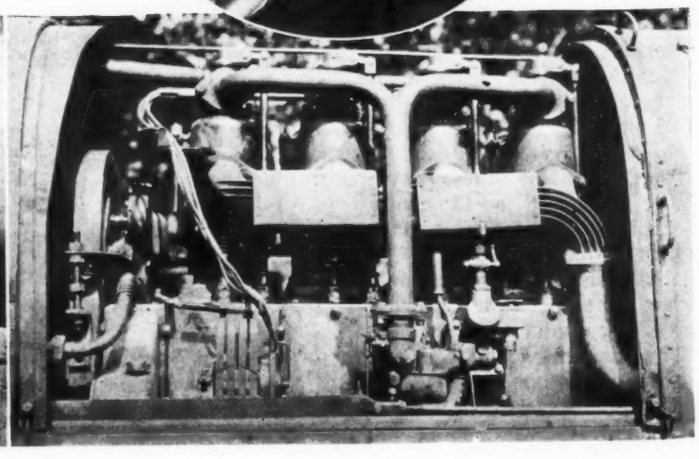
A FEATURE of the 4-cylinder tractor is the rope-carrying device. The rope was used for drawing big guns in position. The guide rollers for using the rope for guns at the rear are shown below the rope. When drawing a gun at the side, it was passed through guide rollers just ahead of the big wheels.

Photos by Lazarnick





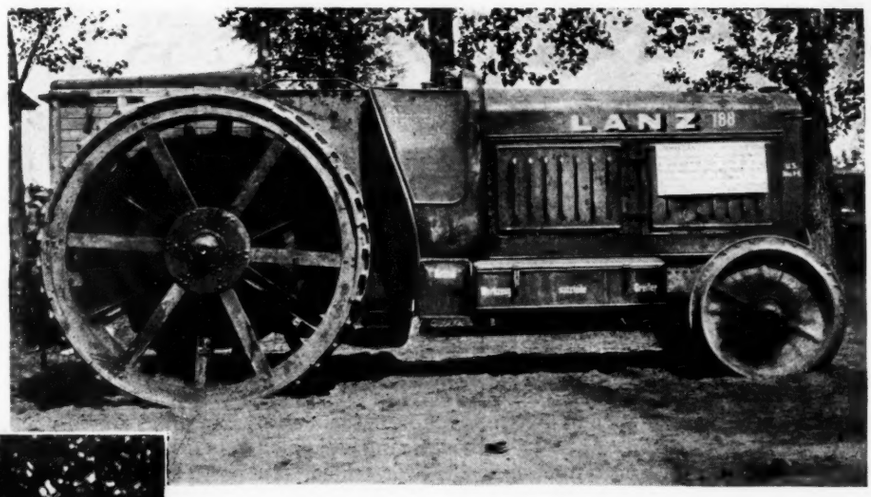


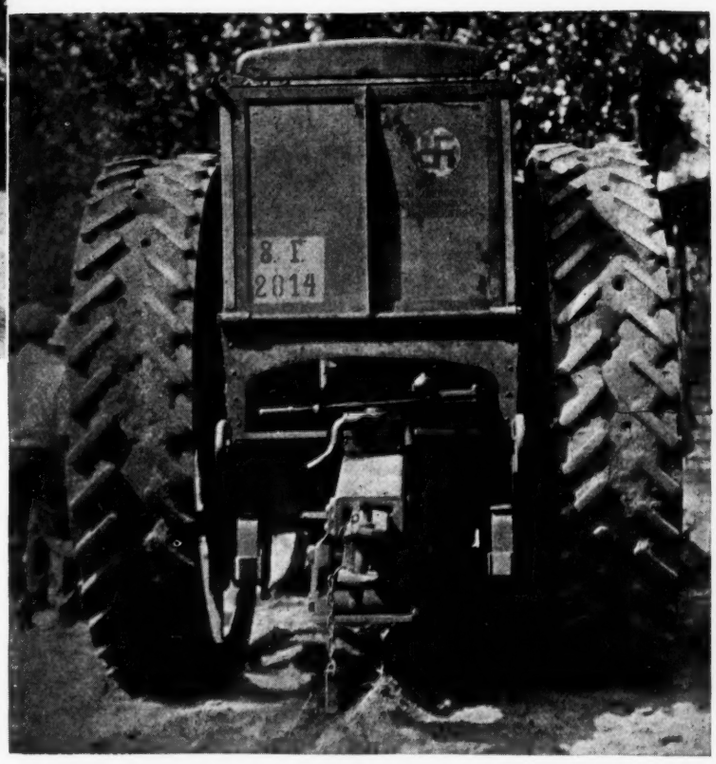


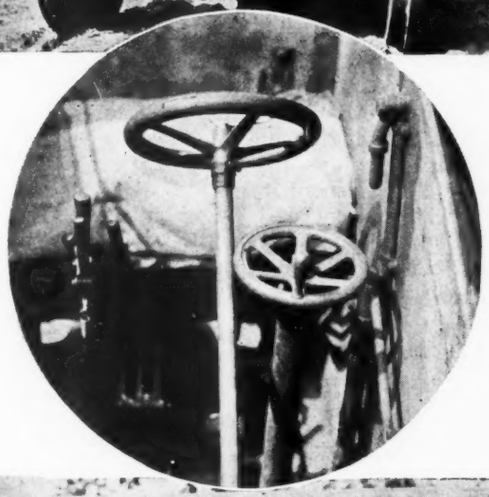
At S. A. E. Summer Meeting—6-Cylinder

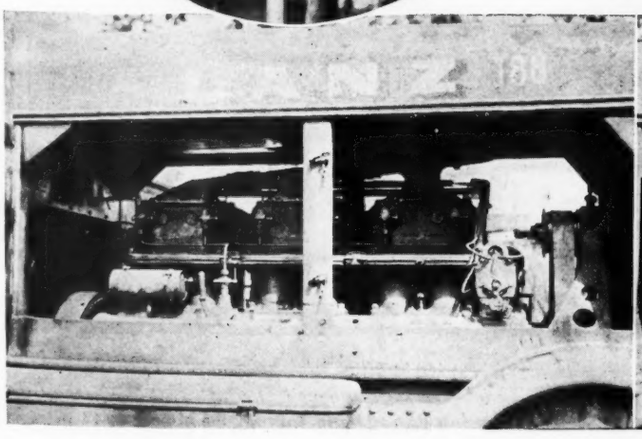
THE cylinders of the six were cast in pairs and its magneto and pump are driven from opposite ends of the same cross shaft. The main fuel tank extends over the engine, a German plan for keeping the fuel warm. Back of the main tank was a tank divided in threes, one for distillate for starting, one for water, one for oil

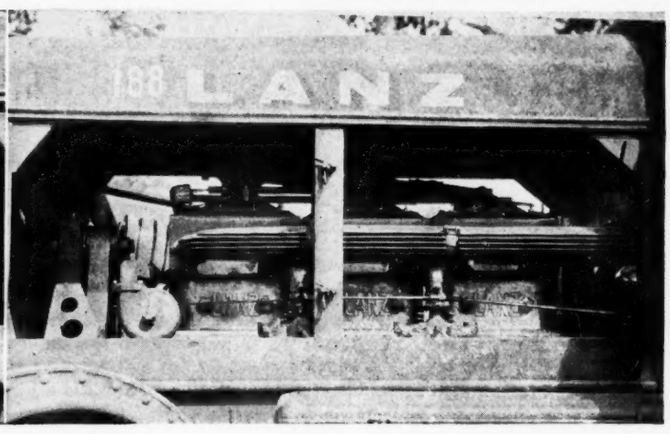
Photos by Lazarnick











British Idea of a Truck That Will Meet the Widest Demand

Big manufacturer will concentrate on one chassis to get back into production. It is two-ton capacity, has a four-speed gear box, medium speed engine with a first speed of 26.5:1, an overhead worm drive and a three-plate type of clutch, and cast steel wheels with hollow spokes.

PROBLEMS of getting back into production are greater with the British manufacturers than with the American. In this country the problem is chiefly that of getting together men and materials to increase the production of vehicles, the making of which was near the suspension point when the war ended. In Britain, the problem is that of creating a design that will meet the revised conditions, after a lapse of four years; also of using as much of the available machinery as possible and of getting something on the market as soon as possible.

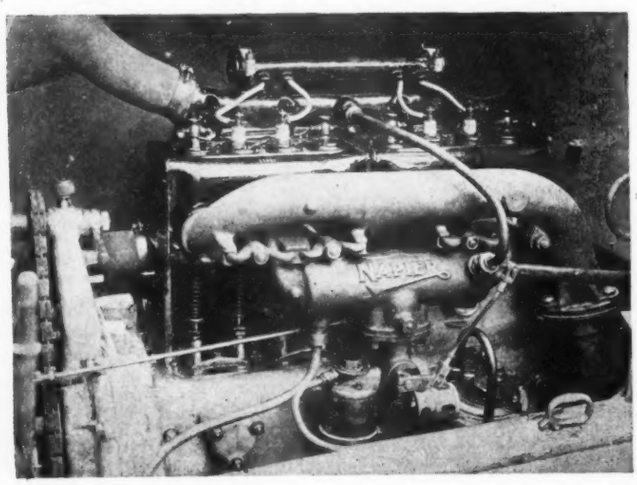
Usually the manufacturers are meeting these conditions by selecting a single type of vehicle and getting to work on it. D. Napier & Sons, Ltd., one of the largest of the British vehicle makers, has selected a single pattern of truck and passenger car for production. The design of the passenger car is not yet ready for publicity, but here is a description of the truck that Napiers think will come nearest to meeting the general demand. The truck is of 2-ton capacity and with load weighs 4½ tons. The chassis weighs slightly less than 2 tons.

An engine of the 4-cylinder type, with cylinders cast in pairs, is fitted. The cylinders are of the L-head type, with a bore of 3 11/16 in. and a stroke of 5 in. Enclosure is provided for the valve springs, and the tappets are made adjustable. Silent chain drive is employed for the camshaft, the high-tension magneto and the centrifugal water pump.

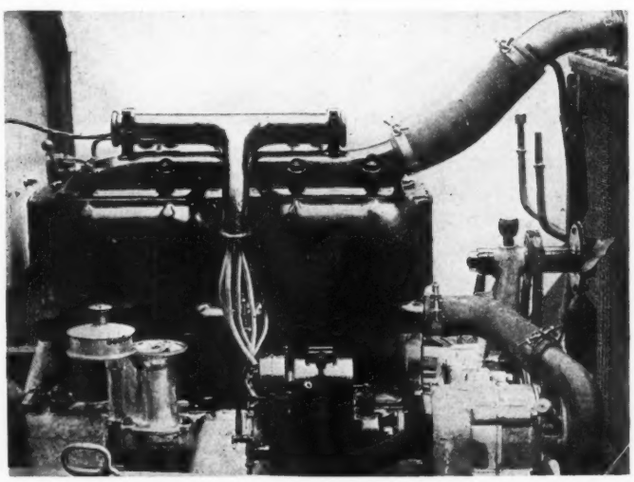
The crankcase is made in aluminum and consists of an upper and a lower half, the latter serving as an oil reservoir and carrying the oil circulating pump. Four-point support is employed, four supporting lugs being cast on the upper half of the case and bolted to knees secured to the frame side members in such a way that the engine can be dropped from the frame for the purpose of dismantling and repairs.

There are three main bearings on the crankshaft, these being of the bronze back, babbitt-lined type. Each bearing has a separate oil feed, and the surplus oil working through the bearings is thrown all over the interior parts by the revolving cranks. Most of the oil flung off by the revolving parts drains back to the bottom of the crankcase. Thence it is drawn through a strainer by the pump and forced through another strainer to the engine bearings. Circulating pump and strainer are so arranged that they can be withdrawn together through a large hand hole above the crankcase. The pump is mounted at an angle and is driven from the camshaft through a pair of helical gears. On the opposite side of the crankcase there is a large oil filler, which is covered by a hinged cap. When this cap is swung back for the purpose of renewing the oil supply, it simultaneously opens the overflow taps, and when it is closed again the taps also are closed. There is an oil pressure gage on the dash. The pressure of feed attains 35 lb. per sq. in. at 1600 r.p.m. of the engine and less at lower speeds.

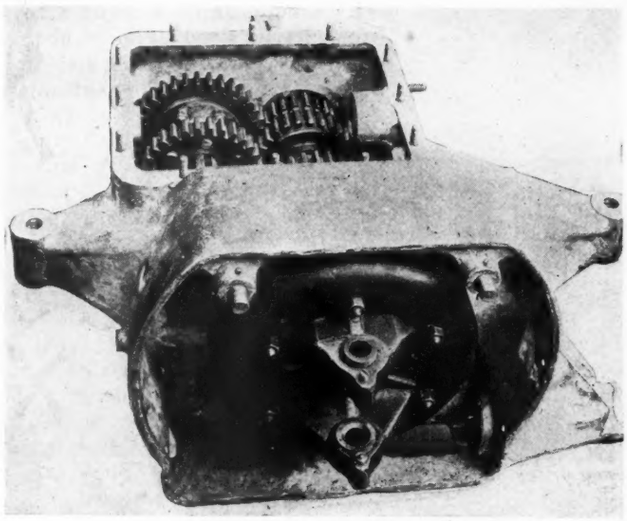
There are large openings in both ends of each cylinder casting, which arrangement facilitates the removal of the core sand when the engine is being built, and also the cleaning of the jacket on subsequent occasions. Cooling water is circulated by a large centrifugal pump mounted in line with the magneto and driven through the same



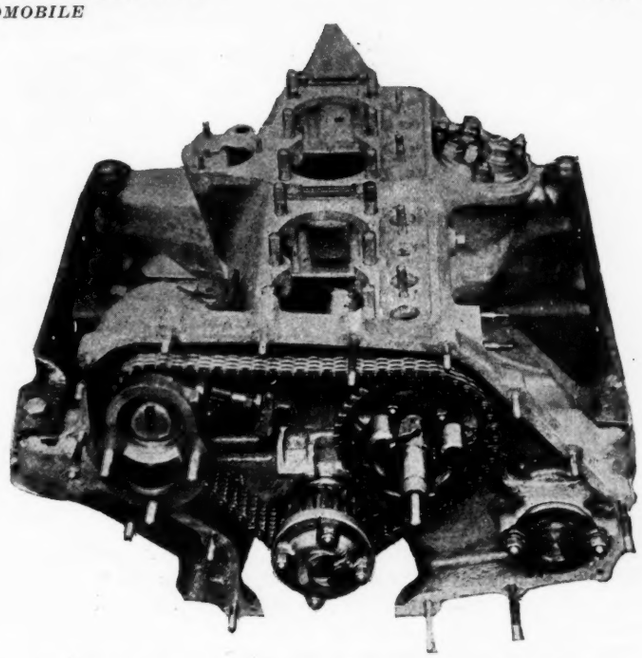
Valve side of Napier truck engine, showing the water-jacketed inlet manifold, carbureter mounting and hand and governor connections to throttle valve



Side view of Napier engine, showing magneto mounting and oil filler with swinging cover, the latter at the same time opening and closing the oil overflow tap



Gear box of Napier truck, carrying a shroud at the rear enclosing the service brake



Forward end of crankcase, showing silent chain camshaft and accessory drive, governor and method of supporting engine on frame

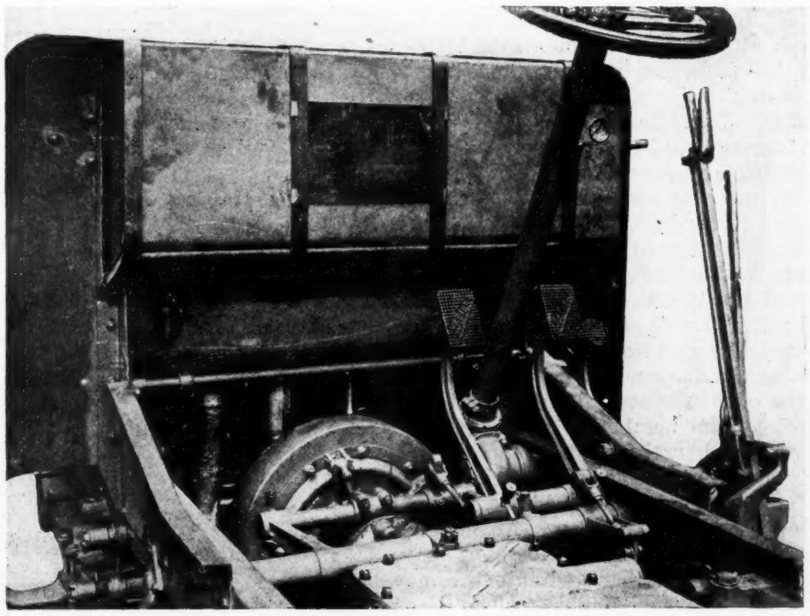
gears. The radiator is of the built-up type, with cast upper and lower demountable tanks and a series of flanged vertical tubes. It is bolted to the frame and set on rubber pads. Back of the radiator is mounted a four-bladed fan, which is driven through a vee-link belt. By means of an eccentric bearing, the belt can be adjusted, and the adjustment can be locked by means of a lever which carries one of a pair of serrated faced bosses behind the fan bearing.

A Solex carbureter is fitted and delivers charge to the cylinders through a water-jacketed manifold. Both hand and foot control of the carbureter throttle are provided. The governor, which is completely enclosed, is mounted on the forward end of the camshaft, and it actuates a special throttle valve in the inlet pipe.

In the engine design provision is made for mounting a lighting dynamo. The fuel tank is located back of the shrouded metal dash. To the rear of the tank is secured a large brass plate, which carries oiling instructions with diagram, and instructions regarding points to be observed in starting, etc. The dash and its attachments, including the angle shaped footboard bracket, are made of steel pressings, which give a light, yet strong construction. The ledge for the engine bonnet is spot-welded to the forward side of the dash.

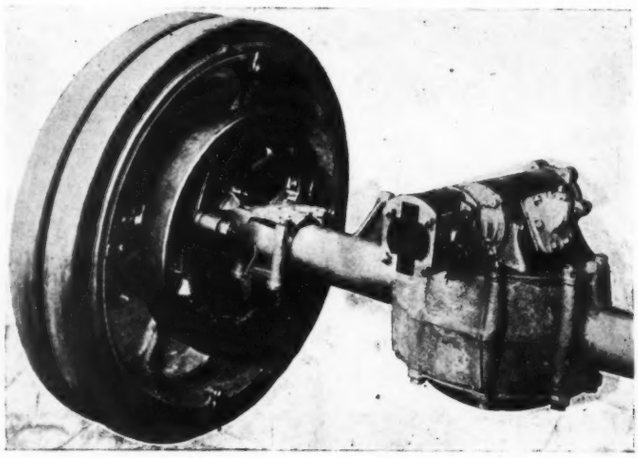
A 3-plate type of clutch is employed, the two outer plates, which form the driving members, being faced with asbestos fabric, while the single driven plate is of hardened steel. Pressure is exerted upon these plates by a series of coil clutch springs arranged in a circle. In spite of the fact that the revolving mass of the clutch is very light, a small clutch brake is fitted to facilitate gear changing.

The 4-speed gear box is a separate unit, and a pair of fabric disc type joints are inserted between the clutch and the transmission box. The gear box is cast of aluminum alloy, and, like the engine, is bolted up against frame lugs from underneath. The two shafts of the transmission are mounted in a horizontal plane. There are sliding members on both shafts, the object being to make the gear as compact as possible, so as to insure the greatest possible rigidity. The conventional selective control system is used, the quadrant and gear lever being mounted outside the truck frame on the right. With the four forward gears, the following gear reductions from engine shaft to rear axle are obtained: Fourth speed, or direct drive, 6.75:1; 3rd speed, 9.8:1; 2nd speed, 14.2:1; 1st speed, 26.5:1. With these gear ratios and a normal engine speed of 1000 r.p.m. a range of truck speeds from 3.8 to 15 m.p.h. is obtained. Three-point support is used for the gear box. The forward end of the box is supported on a tubular cross member of the frame, while the two rear supports are on brackets secured to the frame side members.



Dashboard and control arrangements on Napier truck chassis

A shroud formed integral with the rear end of the gear box encloses the service brake. This brake has a pressed steel drum which is flange-bolted to the driving members, so that it can be easily removed. Combined with this brake drum is one-half of the forward universal joint, which is of the Hooke type. The pins of this universal joint are hollow and filled with lubricant, hence very effective lubrication is obtained. There is only very little motion between the universal joint members, the drive being nearly straight-line. A tubular propeller shaft is used, and at the rear end of same there is a combined universal and slip-joint which is provided with a leather boot.



Worm driven rear axle with emergency brake on rear wheel

The rear axle housing is a one-piece drop forging of the double banjo type, the axle tube portions being bored out from the solid. To the upper side of the banjo is bolted the worm housing, while a large plate covers the opening at the bottom. There is a relief valve in the upper cover, which permits any excess pressure in the axle housing to relieve itself, and this valve is said to also have a very good effect in keeping down the temperature of the lubricant in the rear axle. An elbow-shaped oil filler is provided behind the lower flange of the axle housing. Spring brackets and brake supports are made in a single casting, which is clamped to the axle housing by means of through bolts, which also hold the springs in place.

Cast steel wheels with hollow spokes are used all around and are fitted with metric sized solid rubber tires, the dimensions of which are substantially equal to 34 x 4¾ in., twin sides being used at the rear. The hubs are separate steel castings, provided with flanges to which the wheels are bolted, and fitted with conical type roller bearings.

Both sets of brakes—contracting service brake back of the transmission and expanding emergency brakes on the rear wheels—are faced with asbestos friction fabric. The rear brakes are not enclosed.

A point of interest bearing on the general class of construction is that all pivot members on the chassis are bronze-bushed and provided with large lubricators. Wherever possible, these lubricators form part of the pivots themselves. The steering gear is of the worm and complete wheel type, in this respect following American practice.

Between the two halves of the steering gear housing a shim is inserted, thus providing means of adjustment. Semi-elliptic springs are used both front and rear, the front springs being 40 in., and the rear springs 50 in. long.

This 2-ton Napier truck chassis has a wheel base of 126 in. and a tread of 60 in. The chassis frame is made from pressed steel channel members, 6 x 2 x 3/16 in. All of the cross members, except the rear one, are tubular.

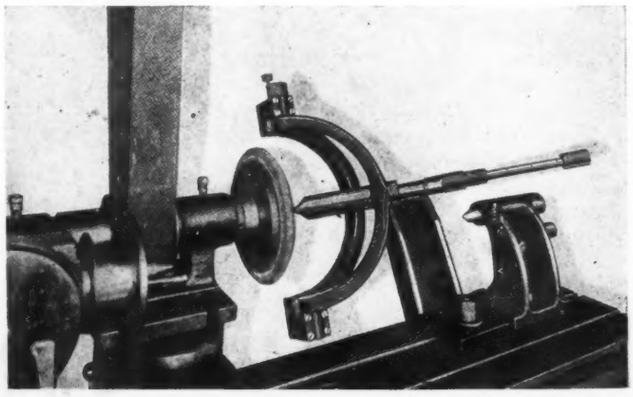
Outside the engine, practically all bearings are of the conical roller type.

A Universal Radius Former

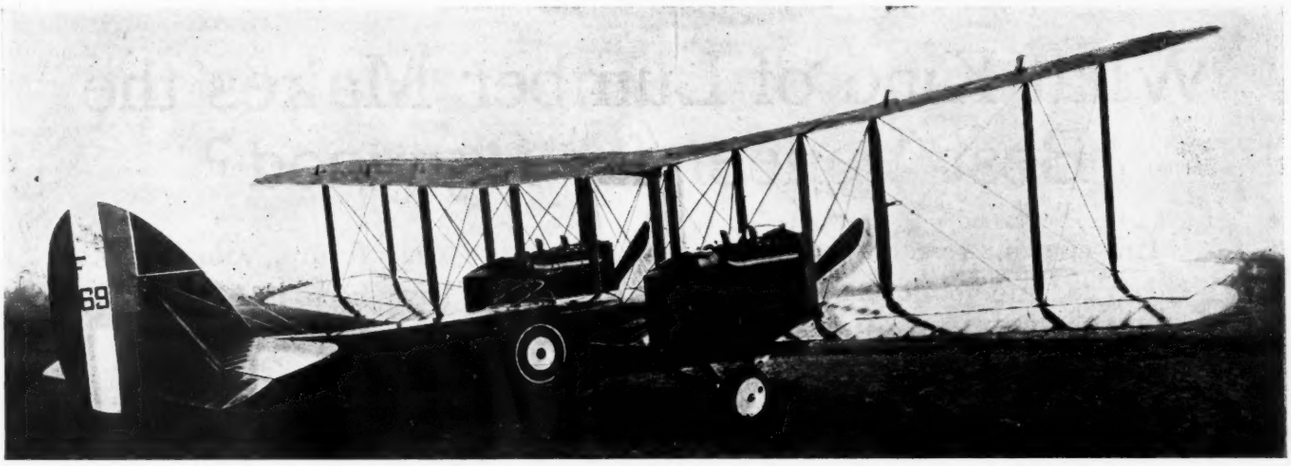
AN attachment of value in the tool room is a universal radius former, which will cut any radius or segment accurately on the grinding wheel. This device can be used to advantage on form cutters, profile mills, cutters for the segments of circles, and any other piece of work requiring any part of a circle.

The movable member may be locked and made stationary to produce a straight line across the face of the wheel. If pressed forward from the central or neutral point, it will produce an inside or female radius on the face of the grinding wheel. Pulled back from the central point, it will give an outside radius by simply turning the diamond holders through an arc of 90 deg. By turning the diamond holder through 180 deg. a half circle can be cut. The size of the radius or segment is determined by the number of thousandths registered on the micrometer barrel from the central point.

By loosening the lock-nut back of the micrometer barrel, the diamond holder rod may be pushed forward or drawn back by half inches. An interchangeable knurled housing, made up of members of several lengths that screw into each other and into the movable member of the attachment, is provided. The diamond holder need not protrude more than one-half inch from the housing. All stresses are transferred by the housing to the frame, and the diamond is held rigidly in position. The design described here is that of the W. T. Smith Mfg. Co.



Universal radius former which will cut any radius or segment



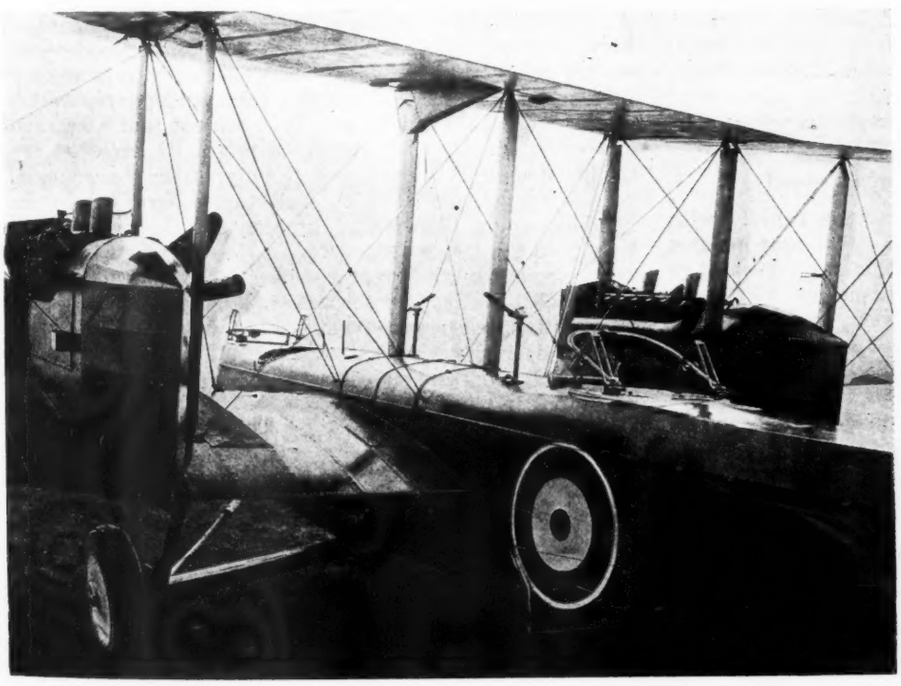
De Haviland No. 10-A Airplane

Three-Seater Twin-Engine Tractor Designed as a Self-Defending Day Bomber

THE object of the Aircraft Manufacturing Co., Ltd., of London, in designing this new machine was to produce a high performance, self-defending, long-distance, daylight bomber. It is claimed for the machine that it is able to go out over the lines with its tanks full for a long journey, and with a heavy load of bombs, entirely immune from enemy aerial attacks; also, that it possesses remarkable power of rapid maneuverability, and can be looped with ease.

Two 400-hp. Liberty engines furnish the propelling power. The weight of the plane fully loaded is 8500 lb., the disposable weight or useful load capacity being 1450 lb. The normal fuel capacity is 215 Imperial gallons, but by mounting an extra tank this capacity can be increased to 255 gal. An oil supply of 24 gal. is carried.

The endurance at full speed is 650 miles. When Rolls-Royce engines are fitted the range is increased to 750 miles and this can be further increased to 900 miles if the extra tank is fitted. These changes, however, will somewhat affect the speed, rate of climb and ceiling of the machine. The speed at low altitude is 134 m.p.h.; at 10,000 ft., 124 m.p.h., and 15,000 ft., 117 m.p.h. The stalling speed is 45 m.p.h. and the landing speed 55 m.p.h. An altitude of 10,000 ft. can be reached in 11 minutes and 15,000 ft. in 20½ minutes. The ceiling is 20,000 ft.



Spontaneous Ignition Temperatures

A BRITISH firm, Mirrless, Bickerton & Day, a few years ago carried through in their laboratory a series of investigations on the ignition temperatures of different engine fuels and from them obtained a lot of useful data, of which the following is an abstract:

	Spontaneous ignition temperature in oxygen Deg. C.	Deg. F.
Gasoline No. 1	272	522
Gasoline No. 2	270	518
Kerosene	252	486
Gas Oil	254	489
Petroleum Fuel Oil	260	500
Shale Oil (Broxburn)	253	487
Tar Oil	470	878
Coke Oven Tar	494	922
Water Gas Tar	464	867
Blast Furnace Tar	498	928
Whale Oil	273	523
Naphthalene	402	756
Alcohol	395	743

From these figures it will be noted that the tars and tar oils have much higher spontaneous ignition temperatures than petroleum oils. This means that a degree of compression which will raise the compressed air to a sufficient temperature to ignite petroleum may be insufficient for tar oils—hence engines of the spontaneous ignition type working on tar oils should have either higher compressions or some other means of raising the temperature of the air.

What Kind of Lumber Makes the Best Veneer for Plywood?

This airplane research is likely to become, in the near future, valuable data to automobile makers. Several suggestions have been made that plywood will be used in the construction of motor car bodies. In this article the selection of the species is discussed by the leading authority.

By Armin Elmendorf*

THE forces acting on plywood parts of an airplane are usually so complex and variable in magnitude that the calculation of the exact sizes of many of the various members is impractical. Consequently in these cases the airplane designer must confine himself to the less exact science of determining relatively superior construction such as the most suitable veneer species, approximate thicknesses, proportions and number of plies. It is the purpose of this article to consider the first of these factors, namely, the species to use where certain properties are desired. The data upon which this discussion is based were collected at the Forest Products Laboratory of the United States Forest Service at Madison, Wis., in the course of investigations made for the War and Navy Departments.

Plywood is being used very extensively for many airplane parts. The so-called monocoque fuselage is usually made of thin 3-ply wood. Ordinary trussed fuselage often has plywood sides and cowling. For such parts as bulkheads, engine bearers, wing rib webs, gusset and thrust plates, flooring, diaphragms, and the leading edges of wings, plywood is often used in preference to all other materials. In some machines stabilizer, elevator and rudder surfaces are also covered with thin 3-ply wood.

Each part of an airplane requires a different combination of mechanical properties. In some cases high tensile strength is required, while in others maximum column or bending strength for a given weight, resistance to splitting, hardness, ability to hold fastenings, steam-bending properties, resistance to abrasion, ability to take a good finish, or a combination of several of these properties may be the controlling factor.

Effect of Density on the Properties of Plywood

The strength of plywood increases very rapidly with increasing density. The hardness and compression strength of wood perpendicular to the grain each vary approximately as the square of the density. The same relation would hold for fairly thick veneer, although for combinations of veneer of different species and thicknesses the number of variable factors is so great that no exact expression can be given on the basis of our present knowledge of the subject. The resistance of plywood to splitting also increases with the density.

Among the most important properties of plywood as a material of construction for airplanes is its resistance to forces that tend to cause failure due to buckling. Buckling is a form of local column failure. Computations based on an extensive series of tests to determine the column strength of 3-ply wood of various species and thicknesses show that per unit of weight, such low density species as spruce, yellow poplar, Spanish cedar, redwood, and basswool give from 2 to 2.5 times the column strength of such high density species as birch, beech, and sugar maple. Therefore considerably greater resistance to buckling should be obtained from the low-density than from the high-density woods.

Veneer Species for Cores

In airplane construction in which the core and the faces of 3-ply wood are of different species, where high column strength combined with surface hardness and minimum warping are desired, it may be necessary to use dense woods for face stock. Full advantage of such strong and heavy species as birch, beech and maple is best obtained by using a thick core of low-density wood as basswood, yellow poplar or redwood rather than a thinner core of the same weight but of a species of greater density. A combination of strong face stock and a thick, light wood core has the advantage of greater separation of the faces than a thinner core of a heavier species, and gives a marked increase in the internal resistance to forces that tend to bend the panel.

We will suppose, for example, that a certain panel contains a core of the same weight but of a specific gravity of one-half that of another core. This means that the core of the lighter species is twice as thick as the core of high density, and that the panel faces are spaced twice as far apart. This is very desirable in a column, for instance, as the maximum load a column can carry varies as the cube of the thickness. It is evident that a marked superiority in the load sustained might be expected for the low-density core panel over the high-density core panel of the same weight. The load to produce failure in bending would likewise be greater for the same panel weight in the low-density core.

On account of the greater separation of the face plies, and probably also on account of the smaller internal stresses induced by low-density wood, warping is less for the low-density core construction.

The following low-density species are satisfactory for core stock in plywood:

Basswood	White pine
Fir (grand, noble, or silver)	Spruce
Redwood	Yellow poplar
Spanish cedar	Western hemlock

Veneer Species for Faces

Face plies serve different purposes in the various parts of an airplane. Hardness, finish, bending qualities and maximum column strength may each be desired. On the

*Engineer in Forest Products, Forest Products Laboratory, U. S. Forest Service, Madison, Wis.

basis of their mechanical properties, veneer species that are considered satisfactory for the face stock of plywood for airplanes may be grouped as follows:

Group 1	Group 2	Group 3	Group 4
Beech	Black walnut	Mahogany (true	Basswood
Yellow birch	Cherry	or African)	Fir (grand, no-
Sugar maple	Silver maple	Red gum	ble, or silver)
	Sycamore	White elm*	Redwood
			Spanish cedar
			White pine
			Spruce
			Yellow poplar
			Western hem-
			lock

*White elm should not be used where a high finish is desired. It has exceptional bending qualities.

The species given in group 4 are superior to species in the other groups for obtaining high bending and column strength for a given weight. Warping is also generally less for these species than for species of the other groups. Some woods, such as spruce, are lacking in finish, unless considerably sanded, and all but light sanding is undesirable, because it may unbalance the construction. In fuselage bulkheads or other hidden parts, where finish is secondary, practically any of the species of group 4 should be satisfactory for the face veneer, as well as for the core stock.

Species of group 1 are the densest in the list and are superior to the other species for hardness, resistance to abrasion and strength of fastening.

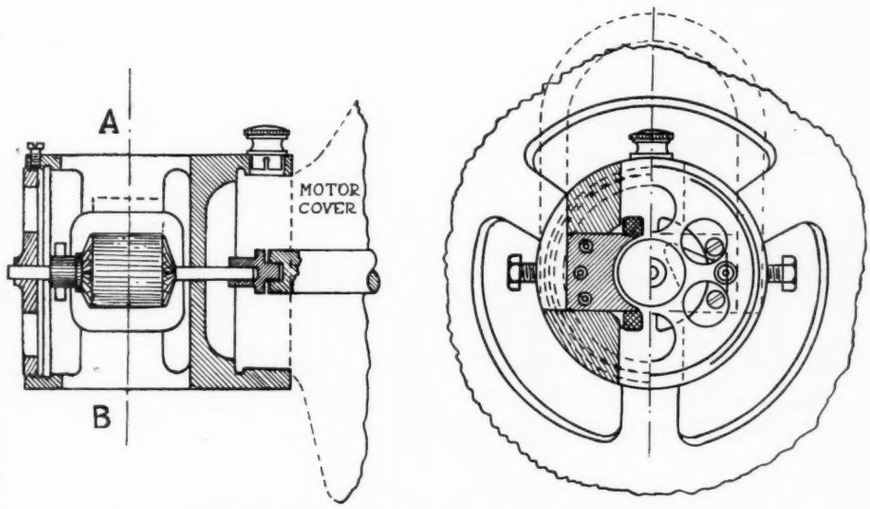
Where finish is desired, species of groups 1, 2 and 3 are satisfactory. Wide differences in the appearance of the grain of the various species in these groups make the selection of species for finish largely a personal matter.

For plywood that must be steamed, or soaked and bent over a form, species of groups 1 and 2 should be used.

Apparatus for Testing Permanent Magnets

IN an article in *L'Elettrotecnica* there is described an apparatus used for testing some thousands of permanent magnets in connection with the manufacture of magnetos for aircraft engines.

On the shaft of a motor (see illustration), supplied by the town network, is mounted a tachometer, and at the opposite side a small direct-current armature A. This armature, constructed of the same material as the armatures of the small magnets, rotates between two pole-extensions BB, to the outside of which may be placed in a suitable recess the horseshoe magnet to be tested. The reluctance formed by the pole-extensions—even those made with the same material as that used for the extension of the magnets—and by the armature has a value equal to the useful value of reluctance of the pole-extension and the armature of the magnets to be manufactured. The distance between the limbs of the magnets is constant within 0.01 and 0.02 mm.



Device for determining residual magnetism and coercive force of permanent magnets

The indications of a voltmeter connected up with the armature brush on d. c. is proportional, for a given speed, to the value of the useful flux generated by the magnet across the armature.

By knowing the constructional data of the armature and magnets, it is possible to determine the constant of the instrument, and to estimate the value of the flux in C.G.S. units. In practical use, it is sufficient to take the reading given at a certain speed by a magnet taken from a magneto that is working perfectly, indicate in red on the voltmeter scale, and arrange to discard all magnets which, for the same velocity, give a deflection less than that marked in red. The voltmeter should preferably be of the central zero type, to prevent loss of time in changing the position of the magnet to be tested.

Having thus measured the useful flux, and hence also the residual magnetism of the magnet, it is easy to determine the coercive force. With this object two teeth are fitted on the pole-extension pieces between which the armature rotates, these teeth being fed with current from a secondary battery, which can be commutated or regulated by suitable means. The m.m.f. generated by the current flowing in the two teeth must give a flux opposite to that of the magnet under test. This m.m.f. can be regulated by the rheostat so as to reduce the voltmeter reading to zero or to a given fraction of the initial value.

The reading of an ammeter inserted in the circuit of the teeth is practically proportional to the coercive force of the magnetic circuit. In the same way as for the voltmeter it is possible to arrive at the constant for calculating this coercive force in C.G.S. units, and in practice, the position of the ammeter-pointer can be indicated in red by testing the magnets of a standard magneto.

Effects of Water Induction

By S. W. P.

ON page 1225 in the June 5 issue the writer notices an article on the injection of water into the cylinders of gasoline engines, which does not agree with some of the observed facts. A six-cylinder Continental engine with which the writer is somewhat acquainted has run 30,000 miles, and the valves have not been ground or the spark plugs cleaned in all this run. The water injection was at the rate of about three pints in 100 miles, sucked into the intake manifold through a quite small tube, and was controlled from the dash.

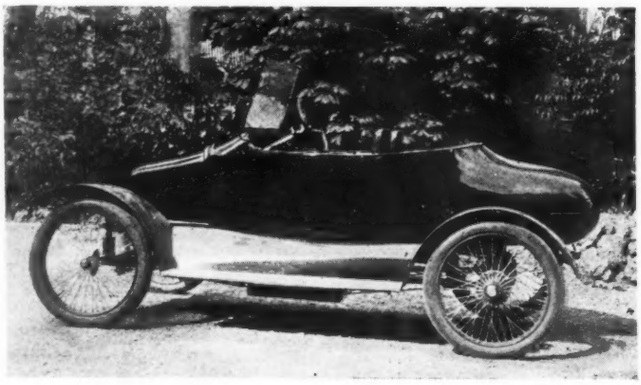
Many auto drivers notice the improvement in the running of their engines at night or on rainy days. Is there not a certain rate in the supply of water that will do what some claim for it? The writer has blown some of the carbon out of a Ford engine by using water in the intake, and would like to know the practical experience of other drivers.

An Electric That Has Many Gas Car Features

Harry E. Dey, the veteran, again is with us and has plans for building a runabout for his light motor. Steering wheel, pedals and general appearance unlike those of established electrics. Motor recharges battery when going down hill and also controls speed to eight miles on down grade.

AGAIN we have with us the Dey electric, somewhat changed, it is true, but still basing its chief claim for attention on the fact that this motor delivers double the power for the given weight as compared with other motors. Harry E. Dey, the veteran sponsor for this motor, now proposes to put it in a runabout which he expects to see in production in the near future. The car he has designed has many of the desirable features of a gas car and a new feature is that the motor recharges the battery when the car is going down hill. This recharging feature limits coasting speed to eight miles an hour.

An interesting feature of the motor is that both the armature and field magnet are rotatable, one element connecting to one driving wheel through a pair of reduction gears, while the other element connects to the other wheel in a similar manner. This arrangement produces a perfect differential gear substitute, and, in addition to saving the cost and weight of this mechanism, it doubles the capacity of the motor for a given size and gear reduction, for the parts rotating in opposite directions cut the magnetic lines twice as fast and give the results of a motor of double the rotative speed, which also adds to the efficiency.



The weight of the motor is still further reduced by using an inside field provided with six poles, all energized by one coil, which is ideal for low field losses and light weight. The total weight of the field with shaft is 19¼ lb. The iron portion is well adapted for drop forging. The total weight of the motor is 51 lb.

The motor is centered on the axle. An eccentric of 7/32-in. throw is fixed to the outer end of each shaft; an internal gear is carried by, and rotates upon the field shaft eccentric, a roller bearing taking care of the friction. An external gear, which is mounted concentric with the shaft, is keyed to the stationary housing and meshes with the internal gear. The latter connects by means of a flexible jointed shaft (practically a floating axle) to the wheel hub. It will be noted that only one of the gears is rotatable, the other being held absolutely rigid.

At the armature shaft end the construction differs by mounting the external gear, instead of the internal one, upon the eccentric and keying the internal one to the housing. From this point the construction duplicates the other end. When the internal gear is the rotative element, as at the field shaft end, the direction of rotation remains unchanged between the motor and the wheel; while with the external gear as the moving part, as used at the armature end, the direction is reversed.

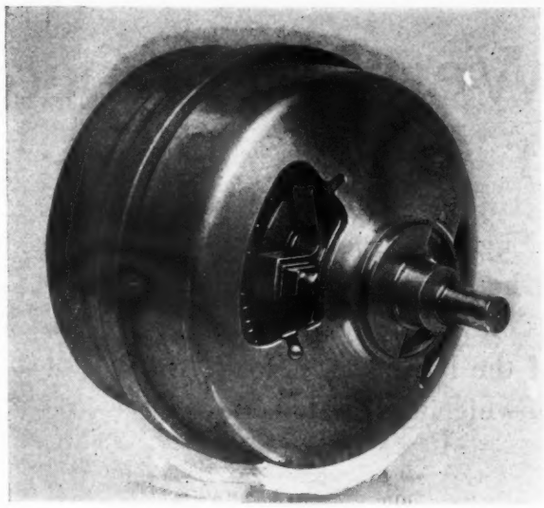
The reverse direction of the armature shaft is thus rectified without recourse to any intermediate gears. The internal gears are of 3½-in. pitch diameter, and the external 3 1/16 in. This produces an average ratio of reduction of 7½ to 1. On account of the large size of the pinion and the large arc through which the gears mesh, dividing the stresses among a large number of teeth, they are very strong. This feature also insures noiseless operation, minimum wear and high efficiency, for there is practically no rubbing action during contact to cause noise, wear and friction. The total weight of all four gears, two on each end, is 4⅝ lb.

The axle is made up of a steel motor and gear housing at the middle, and steel tubing extensions at each end. Caps covering the gears hold the power plant in position; these caps are held in place by taper rings that can be driven off in less time than would ordinarily be consumed in removing a single bolt or nut. These rings also take care of a light aluminum housing that covers the unprotected side of the motor. As the current is taken to the motor through slip rings there is no necessity of disconnecting any wires when removing the motor. In case of an accident to the motor another one can be quickly substituted for it.

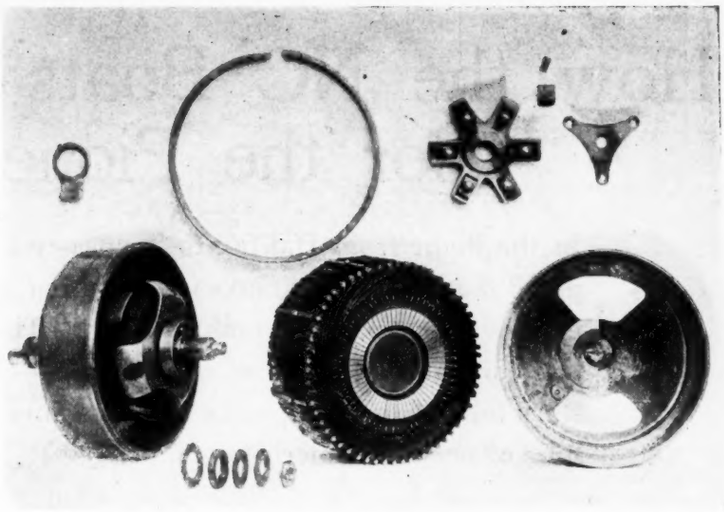
The experimental car was designed with a hand-operated control and wheel steering. It was found upon testing this out in heavy traffic that hand control and wheel steering do not make a desirable combination, for in an emergency both hands are required on the wheel; and in addition there is a time element involved in shifting the hand from the wheel to the control lever that cannot be permitted. In the latest design the control is very similar to that of a gas car, with the shifting gears left out.

For speed variation, a foot lever is used in exactly the same manner as the clutch lever of the gas car; with the foot removed the car runs at full normal speed; a slight pressure inserts resistance in the motor circuit; as the pressure is increased, resistance is added in very small steps until finally the current is entirely shut off; further movement causes the motor to act as an electric brake, and an extreme movement applies the mechanical brake.

There is also an additional emergency brake. An accelerator pedal, acting upon the field, increases the speed



Motor complete. Weight, 51 lb.



Motor disassembled

to 30 miles per hour or more. Another lever controls the reversing switch. This is interlocked with the speed control pedal so that it can only be shifted when there is resistance in the circuit or the motor is entirely cut out.

On down grades the motor recharges into the battery, down to a speed of 8 m.p.h. and automatically slows down in speed as the grade becomes steeper, thus making the driving unusually safe. An increase of speed can be obtained at any time, however, by means of the accelerator.

The steering wheel is hinged to permit tilting when entering the car and the post is inclined at an angle of 30 deg. from the horizontal.

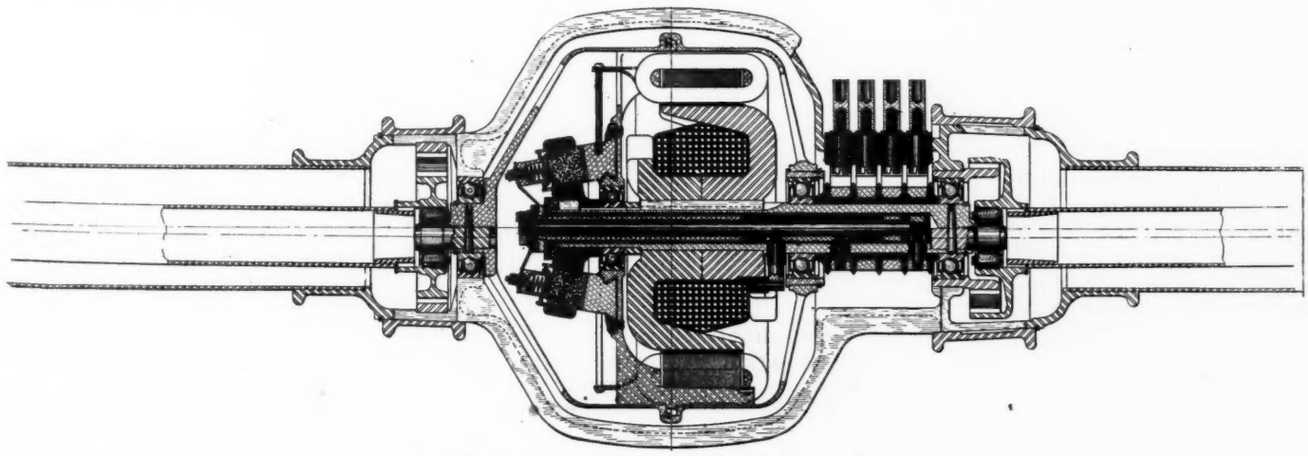
The frame of the chassis is of wood with truss rods under the side bars. The battery is carried beneath the floor and is supported by the truss rod posts. This leaves the body entirely free of encumbrances, permitting it to be used exclusively for passengers and luggage. It also avoids the troubles due to acid fumes and spilled electrolyte. The method of suspension is such that the battery can readily be lowered to the floor, while the top is rendered accessible for adding water by lifting a trap door in the floor of the car. This location is ideal for low power consumption and gives a very low center of gravity, which conduces to an easy riding and safe car.

The springs are the same in principle as those used for many years upon the cushion frame bicycles by the Pierce and other companies. It is essentially the same as a tire pump with a helical spring inside strong enough to support the load, so that in case of air leakage the load will be brought back to its normal position; the air, however, takes up all the shocks and provides an absolute preventive of ever striking bottom. Above the piston the air is compressed upon the rebound, thus making it double acting.

While Mr. Dey strongly believes in light weight, he does not believe in weight reduction at the expense of traveling radius. The total weight of the rear axle, which includes the complete power plant, is only about 100 lb. Air springs, he figures, will save 50 lb., the wood frame with truss rods another 75 lb., and so on. As about 50 per cent of the total weight should be represented by the battery, each pound thus saved in the structural part and power plant means a total saving of 2 lb.

Dey also has designed a portable charging plant weighing only about 100 lb., to be carried under the bonnet of the car. It comprises a 4-cylinder, 4-cycle, air-cooled gasoline engine direct connected to a dynamo very similar in design to the motor on the axle; the field of the dynamo, however, is stationary. This plant will charge the battery at any time, on the road or in the garage, at a rate approximating the average discharge rate, thus keeping them always full if running while on the road. If desired, the plant can be removed from the car and used as a stationary plant for recharging purposes, and also for charging a stationary battery for house lighting, etc.

Dey, some years ago, organized a company to put his car on the market, but the company failed to live up to its agreement, and he has bought back the rights, and has organized the Harry E. Dey, Inc., of Jersey City.



Section through center portion of rear axle

How the NC Boats Were Equipped for the Pioneer Flight

In the flight from Halifax to Trepassey Bar Engineer Moore of the NC-4 noted that the gravity tanks were leaking and he crawled under the propeller and patched the tank in flight. This is one of the incidents told in this concluding section of the official story of the NC boats. Mostly this story tells of the equipment required, much of which was created under the spur of need by American genius.

Part III

By Commander J. C. Hunsaker*

THE equipment of the boats for the transatlantic flight differs somewhat from the installation designed for anti-submarine patrol work. Bombs and bomb racks, bomb sights and release gear were omitted. The machine gun and gunner's position in an egg on the top plane were taken off, as well as the gun installation in the bow and stern of the hull. The radio consisted of apparatus for sending both in air and on water, besides the radio telephone and direction-finding outfit.

The powerplant equipment consisted of the usual thermometers, pressure gages, tachometers, gasoline gages, etc., and for four engines mounted to a very complicated installation to be brought into the boat. Each engine has independent throttle controls and self-starter all brought together at the pilot's seat so that he has complete control of any and all engines at all times.

The equipment for navigating consisted of a bubble sextant, compass and a drift calculator which was improvised from the ground speed bar of Col. Crocco's ground speed indicator as used on Italian airships. This instrument was made up by the Naval Gun Factory from data supplied by Col. Crocco. Special slide rules and tables were prepared to shorten navigational calculations.

With boats as large as the NC's, the pilots no longer control the machine by the feel of it but must be provided with instruments to indicate at any instant just what the attitude is.

The most important instrument is the air speed indicator, as the pilot must know whether he has flying speed and also whether he is flying at economical speed. During the war, various types of air speed meters were tried. Most consisted of the usual pitot tube connected with a sensitive pressure gage. For ordinary speeds, especially the low speeds when leaving the water or landing, the pitot tube gives a very low pressure to be measured. Consequently, an exceedingly delicate pressure gage is needed. Our experience with such gages was not very satisfactory. No reliable and useful speed indicator was available until the Zahm type of venturi nozzle was developed in the Bureau. This merely replaces the pitot tube by a venturi tube. The latter for a given air speed gives several times the pressure of a pitot tube and requires only a cheap and rugged pressure gage. It had been found that flying through rain and spray water gets into leads and makes the speed readings false. In Dr. Zahm's instrument provision is made to keep it spray-proof.

Besides his air speed the pilot wishes to know the inclination or trim of the hull. For this a lateral and longitudinal inclinometer is provided. These are of the usual type, consisting of a bent glass tube filled with colored liquid. The only improvement added by us was the use of fluorescene in the liquid and the addition of a small electric light inside the instrument in such a manner as to be invisible to the pilot yet to cause the liquid to glow with a pale green light. For night flying the pilot should not have a bright light in his eyes.

To give warning of the start of a turn, the compass is not sufficiently sensitive, and several forms of turn indicator have been used. A British type which is useful consists of two pitot tubes, one mounted on each wing tip, connected differentially with a pressure gage which registers the difference between the pressures generated by the two pitots. The NC's for the transatlantic flight were equipped with a Sperry gyroscope which tumbles at the start of a turn and gives early warning.

The boat has interior telephones for communication as well as speaking tubes. The latter are rather difficult to use when all four engines are going on account of the noise, but a special sound-proof helmet was designed which effectively cuts out external noises. The feature of this helmet is the use of a pad of sponge rubber to deaden external noises surrounding a metallic ear trumpet to magnify the sounds transmitted through the speaking tube. It has been found practicable to converse through a ¼-in. internal-diameter tube with the engines running.

Other equipment consists of sea-anchor, emergency rations and thermos flasks, special clothing, fire extinguishers, running lights, signal lamp and interior lighting arrangements.

A hand-operated pump is provided to drain the bilges of water and a careful arrangement of ventilators flushes out any gasoline fumes which may accumulate in the hull.

A small supply of spare parts and tools for emergency repairs in flight is carried and proved its usefulness on the NC-4 en route from Halifax to Trepassey Bay. Her engineer, Moore, noted that the gravity tank was leaking gasoline around some rivet heads after the flight had been under way for some time. This tank is located in

*Bureau of Construction and Repair, Navy Department. Paper presented at the Summer Meeting of the S. A. E.

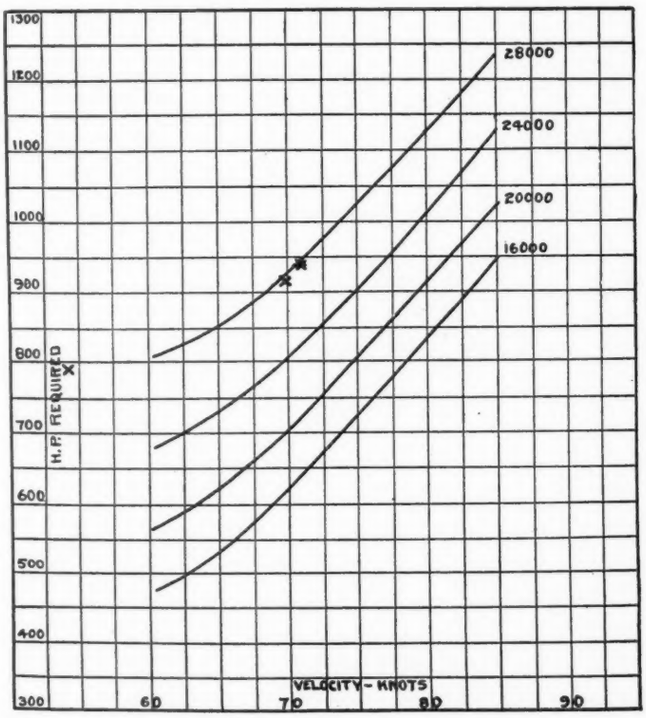
the upper wing, immediately over the central pair of engines. He left his position in the stern of the boat, crawled along the top side and under the guard of the rear propeller and climbed up on top of the center engines and while going through the air at 80 miles per hour stopped the tank leaks. To permit such a passage a sheet aluminum tunnel had been installed on top of the boat under the after propeller which prevents a man's clothes being drawn into the blades.

Calculations of Performance

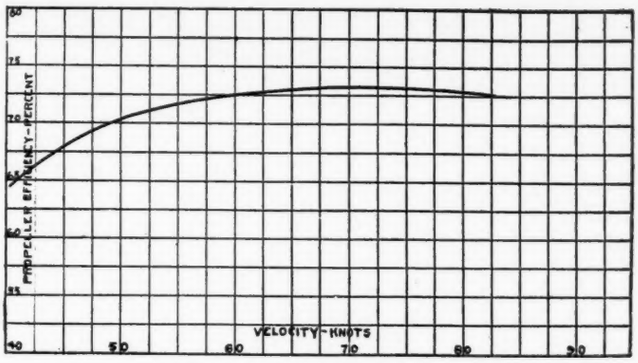
In designing the NC, it was at once clear that the cost would necessarily be very high for the first units, not only on account of their unprecedented size, but because of the great amount of experimental work necessary. Naturally, if the boats were a failure in performance the funds spent could hardly be justified. Very careful calculations of the relations between speed, power, resistance and endurance were made. I am very happy to say the performance actually realized on trials checked the calculations very closely. In fact, the precision of the measurements of speed, power and fuel consumption on the trials was such that we do not know whether the calculated or the measured values were nearer the truth.

The performance was calculated from a determination of the total drag of the machine at various angles of incidence and speeds, corresponding to different gross loads. In arriving at values of the drag for the various speeds, the angle of incidence of the wings was the determining factor. This angle of incidence was determined by the different gross loads which would obtain as the weight dropped off as fuel was consumed.

From these drag calculations curves were drawn of horsepower required plotted against velocity. The curves for various gross loads of the machine are given. Since for the transatlantic flight it was intended to fly these machines at their economical velocities to obtain the maximum possible cruising range, special propellers to



Horsepower required and velocity curve. Curves are calculated and the three points (×) are taken from actual test data on NC-2 trials at 28,000-lb. load



Curve of propeller efficiency

give maximum efficiency over this speed range were constructed. The curve of propeller efficiency is reproduced in which allowance for the reduction in efficiency of the center pusher operating in the slip-stream of the center tractor has been made.

The percentages in the following table give the distribution of this drag at a 5-deg. angle of incidence of wings and a velocity of 70 knots:

	Per cent
Hull, cockpits and appendages	4
Wing tip floats	3
Powerplants and radiators and installation	20
Tail booms and braces	1
Wing struts	3
Rudder and fin	1
All wiring	12
Stabilizer and elevators	3
Total parasite	47
Wings	53
Total drag	100

The economical cruising velocities in still air are those velocities which correspond to the maximum ratio of the gross load to the total drag of the machine, assuming that the propellers will give their maximum efficiency and the engines will be so operated as to give their minimum fuel consumption per brake horsepower delivered at the velocities corresponding to this angle as the gross load decreases due to fuel consumed.

The brake horsepower used in computing the cruising range curves was determined by dividing the horsepower required at the economical velocities for the various gross loads by the propeller efficiencies at these velocities. The area under the curve between an abscissa which represents the gross load less gasoline and the gross load abscissa gives the maximum cruising range in nautical miles in still air. The cruising range is limited by the maxmum load which can be sustained in the air. Assuming that the fuel consumption of the engines in flight will vary as the consumption on the block test in the laboratory, when the maximum gross load at which the machine will get into the air in sustained flight is determined for three and for four engines, the maximum cruising range can be determined for either installation. The area under the three-engine curve between the 16,340 and 17,670 lb. ordinates represents the increase in range due the weight saved on the fourth engine installation and the weight of oil to be consumed by it, provided three engines could get the same load into the air as four engines do. The block test curves show that

below a gross load of 23,500 lb., the maximum range for three engines is increased in addition by the area added due to the steeper slope of the three-engine curve. However, a larger gross load can be lifted into the air with four engines than with three, and the added reliability of the machine due to the fourth engine must be taken into consideration. The block test data appeared rather optimistic and showed a very low average consumption. It was decided, therefore, to put a blanket factor upon all average block tests and use a straight fuel consumption in flight of 0.5 lb. per b. hp. per hr. for both three and four engine installations.

This neglects the loss in propeller efficiency of the tandem pusher in the four-engine installation, which was within the precision of the blanket fuel consumption figure assumed and the probable error due to the failure of an engine. The worst failure that might occur would be that of the center tractor, since then the center pusher propeller due to the absence of the slip-stream of the tractor propeller would be running in an air stream of a greatly decreased velocity from that for which it was designed. The failure of either outboard tractor would give a yawing moment due to the unbalanced thrust and the drag would also be added to it by the drag component of the rudders held over to keep the machine on its course in addition to the drag of the dead propeller. The "ideal" failure would be, if a failure must occur, the center pusher engine, since it would not affect the steering qualities of the machine. As a matter of fact, the corkscrew rotation of a pusher slip-stream not being straightened by any body behind it, causes, in yawing to one side, the middle rudder to ride at a relative angle of incidence and gives a yawing force on the machine. This yawing force must be counteracted by a steady force on the rudder bar. In addition, as a driving unit, the pusher engine due to a lower propeller efficiency is the one that can best be spared. Using a blanket fuel consumption narrows the problem to that of being able, leaving out of consideration the damage which might be caused by the tips of the propellers failing while cutting through green water or to the hull or wings in taking off, to get into the air using four engines with a gross load which will give under the 0.5 lb. per b. hp. per hr. curve a greater area between this maximum load and that which can be lifted by three engines than that area under the curve as represented by the ordinates 16,340 and the 17,660 lb. corresponding to the weights of the two different powerplant arrangements.

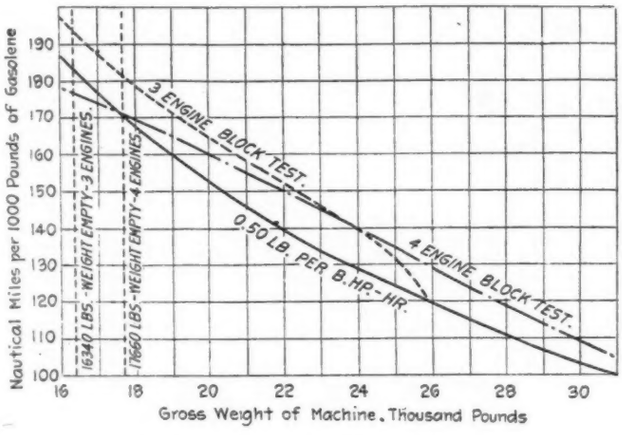
The following figures based on 0.5 lb. per b. hp. per hr. show a comparison of the maximum cruising range with four engines and with three.

Engines	Maximum initial load, lb.	Range, nautical miles
4	28,000	1,420
3	25,000	1,320

Tests at Rockaway

Accordingly, tests were made at Rockaway to determine whether three or four engines should be used in the transatlantic flight. The NC-3, although four engines were installed, was loaded to 26,000 lb. The center tractor propeller was taken off and a proper pusher propeller put on the pusher engine. The machine failed to get off. However, with the four-engine installation operating, loaded to 28,000 lb., it got off. With this heavy wing loading, 11.8 lb. per sq. ft., the machine was handled satisfactorily in the air; therefore, aside from the added reliability, the four-engine installation showed the better cruising range and was adopted. The points spotted in on the 28,000-lb. horsepower required curve reproduced represent actual test data from runs made April 12 and 14 at Rockaway on the NC-2 with the four-engine, two-wing tandem, installation.

Curves were supplied to the pilots to show at what velocities the machine should be flown to obtain the maximum cruising range under operating conditions. As the load goes off due to fuel consumed, the economical velocity of the machine must change to keep the machine at its maximum load-drag ratio, which is a constant for a given machine. The angle of incidence of the wings is 8 deg. for the NC. This velocity and consequently the corresponding angle is not the same for operating conditions when there is a wind component along the course as it is in still air. These curves, which are reproduced, show fuel consumption plotted against velocity, the six curves covering flying loads of from 28,000 down to 16,000 lb. To obtain the economical velocities:



Curve showing maximum cruising range

(1) *Still air*—From zero velocity draw a tangent to the load curve at which the machine is flying. The point of tangency gives on the horizontal velocity scale the economical velocity of the machine.

(2) *Tail wind*—From the velocity of the tail wind as read on the horizontal scale to the left of zero a tangent to the load curve will give the economical velocity, flying with that particular tail wind.

(3) *Head wind*—From the velocity of the head wind as read on the horizontal scale, to the right of zero, in the same direction as the velocities of the machine a tangent to the load curve will give the economical velocity with that particular head wind.

In the transatlantic flight the component of the surface wind along the path was communicated to the machines by the destroyers stationed along the path. This surface wind would give a good indication of what might be expected at the height at which the machines were flying.

Actual test data on the machines gave results which, within the limits of experimental error in reducing these results to the propeller efficiency condition required, were a check upon the calculated data. Therefore, the accuracy of the curves for their purpose in predicting the performance of the machines was verified.

The weights used in calculating the maximum cruising range of the machines for four and for three engines were:

FOUR ENGINES, 17,660 LB.

Detailed	Lb.
Light condition	14,700
Crew, including flying equipment	1,000
Radio, telephone and telegraph set, installation and accessories	300
Water in radiators	340
Oil	1,000
Outfit and equipment	316
Total	17,656

THREE ENGINES, 16,340 LB.

Detailed	Lb.
Subtract from four-engine condition:	
Engine, bare	820
Water in engine	45
Water in radiator	50
Radiator	105
Propeller	60
Electric starter	35
Oil	200
Total	1,315

Allowance was not made for the saving in weight due to tank weights, since the tanks were in units of 200 gal. each and whether one or two tanks could come out would depend of course on the amount of fuel that the three-engine boat could take off with.

Specification Data

The NC flying boat weighs when fully loaded 28,000 lb., and when empty, but including radiator water and fixed instruments and equipment, 15,874 lb. The useful load available for crew, supplies and fuel is, therefore, 12,126 lb., or over 43 per cent. This useful load may be put into fuel, explosives, freight, etc., in any proportion desired. For an endurance flight there would be a crew of five men, 850 lb.; radio and radio telephone, 220 lb.; food and water, signal lights, spare parts, and miscellaneous equipment, 524 lb.; oil, 750 lb., and gasoline 9650 lb. This should suffice for a flight of 1400 sea miles. The radio outfit is of sufficient power to communicate with ships 200 miles away. The radio telephone would be used to talk to other planes in the formation or within 25 miles.

Weight statements are always of interest to aeronautical engineers, and I give herewith an analysis made up from the detail weights.

Weight Distribution

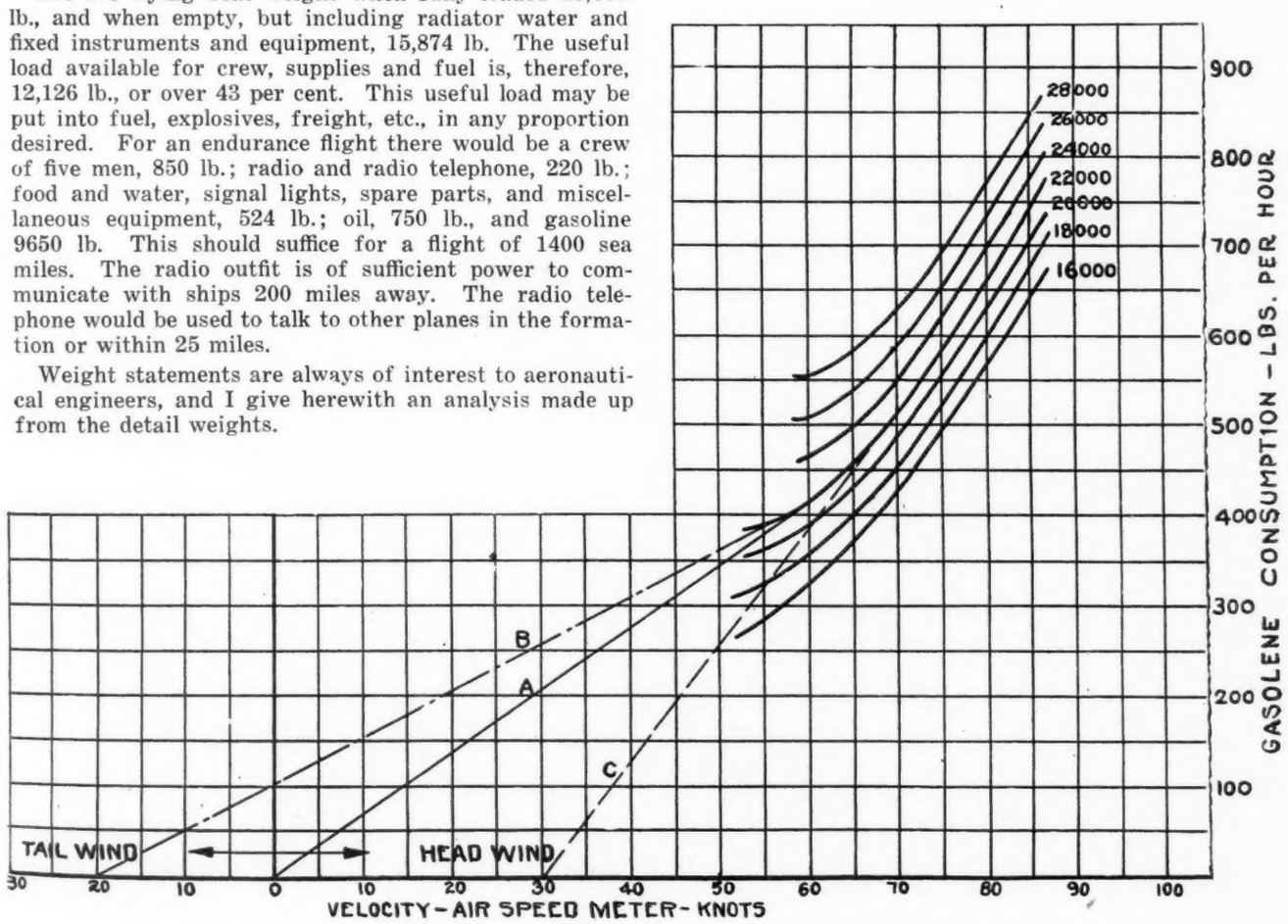
	Lb.	Percentage	
Tail surfaces and outriggers	1,019	6	3.6
Wings, struts, wires, fairings	4,042	25	14.4
All tanks, pipes and fittings	892	6	3.2
Four powerplants complete	4,799	30	17.2
Installation and foundations	742	5	2.7
Hull, wing floats, fixed equipment, controls, etc. (bare hull 2,800 lb.)	3,740	24	13.4
Water in radiators and engines	640	4	2.3
Weight empty	15,874	100	...
Useful load	12,126		43.2
Gross weight	28,000		100.0

Unit Weights

	Lb. per sq. ft.
Wings, including ailerons completely covered, with all fittings	1.19
Wing struts and interplane wires	0.49
Elevators, complete ready for installation	0.88
Horizontal stabilizer, complete	0.96
Rudders and fins, complete	0.91
Tail group, braced together as a biplane but not including outrigger booms to hold it in place	0.95

	Lb. per lb. displacement
Bare hull, normal displacement, 22,000 lb.	0.12
Bare hull, abnormal displacement, 28,000 lb.	0.10

	Lb. per gal.
200-gal. aluminum gasoline tank, complete with fittings and gage	0.35
91-gal. terne plate gravity tank	0.90



Navigation curves supplied to pilots of NC boats

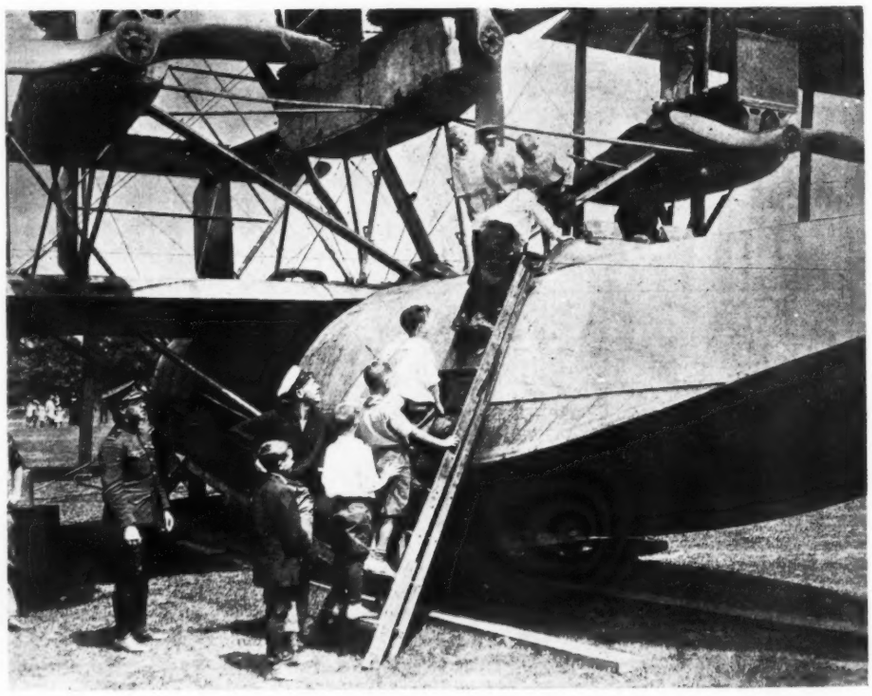
	Lb. per b.hp.
Radiators, empty, range between types used	0.30 to 0.38
Propeller and hub	0.24
Water for engines, including water for engine radiators and piping	0.40
Total powerplant, exclusive of foundations and structural bracing	4.00
Foundation and structural bracing	0.46

The principal dimensions and characteristics of the NC type may be summarized as follows:

Type engines	Liberty
Number of engines	4
Power, hp.	1600
Span, upper, ft.	126
Span, lower, ft.	94
Length, ft. in.	68—5½
Height, ft. in.	24—5⅛
Chord, ft.	12
Gap, ft.	13½ to 12
Wing curve	R. A. F. 6
Angle of wings to hull, deg.	3
Angle of engines to hull, deg.	0
Angle of stabilizer to hull, deg.	2
Upper dihedral angle, deg.	0
Lower dihedral angle, deg.	3
Wing area, including ailerons, sq. ft.	2,380
Aileron area, sq. ft.	265
Stabilizer area, sq. ft.	268
Rudder area, sq. ft.	69
Elevator area, sq. ft.	240
Fin area, sq. ft.	79
Weight, empty, lb.	15,874
Weight, loaded, lb.	28,000
Useful load, lb.	12,126
Capacity of gravity tank, gal.	91
Capacity of fuel tanks, gal.	1,800
Capacity of oil tanks, gal.	160
Maximum speed at 28,000 lb., knots	74
Minimum speed at 28,000 lb., knots	58
Maximum speed at 24,000 lb., knots	84
Minimum speed at 24,000 lb., knots	55
Center of gravity	35 to 45 per cent of wing chord
Factor of safety for 28,000 lb.	3

As I stated above, the NC design represents organized engineering. It is impossible to give credit correctly to many engineers who did good work on her, especially to the men in the Bureau and in the Curtiss organization who did the work as regular routine duty. With many engineers doing good jobs is so normal a day's work that it is only when a failure is recorded that their names appear. It should be of interest to record, however, the responsibility of certain individuals for important features. For example: Glenn H. Curtiss suggested the outrigger type of tail and Starr Truscott and Prof. Luther of the Bureau developed the theory of the difficult and indeterminate structure required so that it could be designed with confidence. Naval Constructor H. C. Richardson designed the hull of the boat with the assistance of Naval Constructor McEntee, who conducted the towing tank experiments, and W. L. Gilmore of the Curtiss company, who got out the structural details. The design and construction of the wing girder was handled by Naval Constructor G. C. Westervelt, who had as his assistant for matters of structural design and safety Ensign C. J. McCarthy, formerly of the instructing staff of the Massachusetts Institute of Technology. Dr. A. F. Zahm made the wind-tunnel investigations, and Lieut. C. B. Harper of the Bureau made the performance calculations. The connection of Messrs. Gilmore and Christen of the Curtiss company with the design touched all points and cannot be summed up in few words. In the actual building of the boats, Naval Constructor Westervelt took charge and arranged for parts contracts as given above. Naturally, all of these firms contributed their knowledge and experience.

In short, the NC design is an all-American proposition like the Liberty engine. It represents the organized result of what we had learned from previous experience, what we could deduce as to the future by application of aeronautical engineering theory and methods and what we could learn from foreign practice.



The NC-4 in Central Park, New York

Paying Wages Through a Bank

NOT long ago the manager of a big industrial plant in England saw several hundred of his employees crowded around the paymaster's window, drawing their wages. It struck him that this was not only a waste of their time, but that it was an undignified scramble for the money they had earned.

Going back to his office, he worked out a plan that combines dignity, time saving, and thrift. This has been approved by the company.

Instead of asking employees to congregate around the pay window and wait their turn, they may open a checking account at any bank selected by themselves, and the company deposits wages each week to the employee's credit, in his own bank. The employee then pays household bills by check, draws out whatever cash is needed, and leaves the balance in the bank as savings. The company makes a further contribution to his account representing about five per cent interest on all the money which he is able to save.

The FORUM

Tractor Spark Plugs

By O. C. Rohde

AN automobile engine runs at full load and speed during only a very small part of its term of service. A tractor engine is running at full load practically all the time. Because of this and the fact that low grade fuels are largely used in tractor engines, the problem of spark plugs for tractors differs to some extent from that of spark plugs for automobiles.

As a rule, the use of low grade fuel means higher temperature and more dirt and carbon. The last item is made still worse by dust taken in while working during the dry seasons.

It is impossible at the present time to recommend any one type of plug for tractor work. High temperature engines require a plug with an insulator which is exceptionally good electrically, can stand the repeated applications of high heat and at the same time not have enough of the central electrode exposed to cause overheating which may induce pre-ignition. An oily engine requires a plug having an insulator with unusually long shorting surface at the firing end.

In spite of the great number of different plugs on the market, there are in reality just two types, those with petticoat or open insulators and those with conical or closed insulators. The former can be recommended for the engines which show a tendency to foul up rapidly, while the latter are recommended only in case the extra extension of wire in the petticoat type shows a tendency to cause pre-ignition.

Failure of one or two plugs on any particular machine should not be considered enough cause for a change to another type of plug. A few defective plugs do get out into service from time to time in spite of the utmost vigilance on the part of the plug manufacturer.

Troubles due to spark plugs may be divided into two classes: 1, cutout or missing; 2, pre-ignition.

A missing plug can usually be detected by shorting from the upper terminal of the plug to the engine with a screw driver. The miss may be caused by a broken insulator. If this is the case, the plug will miss fire pretty steadily both under load and while running idle. The only remedy in case of a two piece plug is a new insulator and in case of a one piece plug, a new plug.

The miss may be caused by an insulator which is weak electrically. If this is the case, it will miss when under load, but will recover when running idle. The remedy in this case is a new plug with a better grade of porcelain. In a case of this kind, it is not always necessary to get another make of plug, but to specify to the dealer that the very latest insulator is desired. In case of Champion Toledo plugs, "3450" insulator will usually solve this trouble.

The miss may be caused by fouling or surface short. By this we mean that a continuous layer of carbon or other conducting material has been deposited on the lower end of the insulator and the spark is traveling through this instead of across the gap. A miss of this kind is usually intermittent for a while and finally the plug stops firing altogether. The immediate remedy is to clean the insulator either with a good cleaner, or in case of a two piece plug by taking it out of the shell and cleaning with gasoline and by scraping if necessary. Where plugs show a tendency to foul up in this way very rapidly, especially where a wet, shiny coating of oil is deposited, it is advisable to change to another brand of oil, which in many cases will get rid of most of this trouble.

Pre-ignition may be caused by other things than the plugs. If it is severe, it sometimes manifests itself by a spitting back through the intake, but it is always accompanied by a loss of power. What actually happens is this: Some part of the material inside the combustion chamber, valves, carbon, plugs, etc., has become hot enough to fire the mixture before it is time for the spark. The piston is not yet at the top of its compression stroke when the force of this premature explosion tries to drive it back down. The momentum of the flywheel carries it over for a while, but power is, of course, lost. In case of pre-ignition, the engine should first be examined to see whether there is an excessive accumulation of carbon and whether there are any particles hanging loose on valves or spark plugs.

The plugs should be looked over for rough edges on either wire or shell. If a petticoat plug is being used and no indications of this kind are to be found, it may be advisable to try a conical plug, which very often will overcome the trouble, though it may need more frequent cleaning.

Occasionally the electrode wire shows signs of pitting or burning. This is entirely due to the use of defective material and there should be very little of it. If it does occur seriously it should be reported to the plug maker.

In general, the spark plug manufacturer is prepared to cope with the tractor plug problem and can furnish plugs to meet all present requirements. However, present day development in engines and fuels is so rapid that the material on the market is not always the latest obtainable. The dealers are learning to classify plugs for the various conditions of service, and if the tractor owner will specify clearly just what the plug is to be used on, he should have no trouble getting just the plug he needs.—O. C. ROHDE, Chief Engineer, Champion Spark Plug Co., Toledo, Ohio.

Wheel Lugs for Field and Road

IN a recent article on farm tractors in *Der Motorwagen*, Dierfield discusses the design of wheel lugs. These, he says, should be designed in accordance with the nature of the ground on which the tractor is to work. A properly designed lug must give the tractor sufficient grip in straight driving both on the level and up inclines, must prevent the wheels slipping during turning, must not become clogged up, and must not cause too great a resistance to motion. Further, they must be so fitted that if only one wheel is gripping on slippery ground they do not cause the machine to skid sideways. Angle iron, conical, spade and wedge-shaped lugs as used in field work are all unsuitable for highways owing to the damage they do to the road surface.

For this latter purpose the lugs should be small and placed closely together or the wheel rims left smooth. For European use where fields are small and joined by hard macadamized roads, it is essential that the lugs should be quickly detachable and interchangeable. This prohibits the use of lugs fixed by several bolts, which would take too long to unscrew and tighten up.

New Price Maintenance Plan Outlined by Trade Commission

Manufacturers who are interested in maintaining the fixed price of their products will find much of interest in this report to Congress by the Federal Trade Commission. The proposal is that a special commission, or court, be organized to handle the individual applications for fixed prices. The elements entering into the decision are discussed in the report, as well as the present law bearing on the situation.

WASHINGTON, July 21

LEGISLATION that would give the price control of products to the manufacturer is proposed by the Federal Trade Commission in a special report to Congress. The proposal is that Congress establish an agency with which manufacturers desiring to fix and maintain resale prices shall file descriptions of products, sales contracts and price schedules.

The report clearly sets forth the belief of the Trade Commission that a blanket fixed price law is not wise. It proposes a disinterested agency which will examine and pass on each proposal on its merits. This report is, of course, of special interest to automotive manufacturers who are anxious to maintain their price lists.

Following is the full text of the Commission's report to Congress:

"The Federal Trade Commission, under paragraph (f), Section 6 of the Federal Trade Commission Act, addresses the Congress by way of a special report designed to direct attention to the subject of control of resale prices by the manufacturers of a class of articles in interstate commerce.

"The question is, whether or not a manufacturer of standard articles, identified either by trade-mark or trade practice, should be permitted to fix by contract, express or implied, the price at which the purchaser can resell them.

"The question has been continuously before the Commission since its creation. It has been the subject of study, investigation and hearing and constantly recurs in various forms in complaints filed with the Commission by business concerns.

"The Supreme Court has made it clear that, in the present state of law, the maintenance of a resale price by the producer is a restraint of trade and is unlawful.

"Such being the judgment of the Supreme Court, the Federal Trade Commission has enforced the law, even though it may have appeared to operate inequitably in some cases. In its enforcement of this rule, the Commission has been mindful that the cutting of a recognized resale price on well-established and identified articles has been, at times, indulged in for unfair trade purposes. When so unfairly used, such price cutting is attempted to be cloaked as lawful competition and justified by the Supreme Court decisions.

"Thus both price maintenance and price cutting under certain conditions are found to be unfair and business men are perplexed. It is with the desire that this perplexity may be terminated that the Commission addresses the Congress.

"It is urged, and the Commission believes with reason, that it would be unwise to vest with the manufacturers of articles the right, without check or review, both to fix and to compel the maintenance of resale prices. It is true that business practice inclines producers to fix the lowest possible retail price in order to secure the greatest possible sale of their product, but in the complex commercial organism functioning between the production of an article and its final sale for actual consumption, both the wholesale and retail merchant are entitled to just compensation for useful service performed.

"It is similarly urged that manufacturers should be protected in their good will created by years of fair dealing and of sustained quality of merchandise.

"The consuming public does not enjoy benefits by unfair price cutting to compensate it for the injuries following demoralization by price cutting. This for the reason that, in the long run, unrestrained price cutting tends to impair, if not to destroy, the production and distribution of articles desirable to the public.

"There must be a common ground wherein the rights of producer, purveyor and consumer may each be fully secured and equity done to all. The search for such ground has been a task of the Commission and results in the following conclusions:

1. **That producers of identified goods should be protected in their property right or good-will.**
2. **That the unlimited power both to fix and to enforce and maintain a resale price may not be made lawful with safety.**
3. **That unrestrained price cutting is not in the public interest.**

"Bills now pending before Congress may well be made to meet the difficulties of the situation if amended to provide for a review of the terms of resale contracts and a revision of resale prices by a disinterested agency.

"Therefore, it is recommended that it be provided by law that if the manufacturer of an article produced and sold under competitive conditions desires to fix and maintain resale prices he shall file with an agency designated by the Congress a description of such article, the contract of sale and the price schedule which he proposes to maintain, and that the agency designated by the Congress be charged with the duty, either upon its own initiative or upon complaint of any dealer or consumer or other party in interest, to review the terms of such contract and to revise such prices, and that any data and information needful for a determination be made available to such agency.

"Such legislation would seem to be in accord with the spirit of the time in that it is designed, by removing this perplexity, to promote the efficiency of manufacturing and

commercial institutions and so to serve the interest of the consuming public.

"The Commission respectfully renews its recommendation of Dec. 2, 1918. The conditions surrounding the fixing and enforcement of the maintenance of resale prices have not materially changed since this recommendation was made. The recent decision of the Supreme Court in United States vs. Colgate & Co. has not apparently legalized contracts providing for the maintenance of resale prices, as the Court expressly stated that the indictment did not charge the existence of contracts in that case and distinguished it from the case of Dr. Miles Medical Co. vs. Park & Sons on that ground.

"If the decision be construed to hold it lawful under the Sherman Law for manufacturers to fix resale prices and to enforce the maintenance of such prices by refusal to sell to those who do not enforce the maintenance of such prices by refusal to sell to those who do not resell at the prices fixed, or by other means, it does not follow that the fixing and enforced maintenance of such prices is not an unfair method of competition within the meaning of Section 5 of the Trade Commission Act.

"In order to establish a violation of the Sherman Anti-Trust Act a contract, combination or conspiracy must be proven. If some device for restraining trade be devised which does not fall within the definitions comprehended by these three terms as construed by the courts, it does not constitute a violation of the act, though restraint of trade may result.

"The enforcement of resale prices on goods in the hands of distributors is identical in its effect upon dealers and the public, whether it be accomplished by contract, combination or conspiracy, or by some other means. An unfair method of competition within the meaning of Section 5 may involve the use of contracts, of the formation of combinations, or conspiracy, but neither of the three is necessary to establish a method of competition.

"Indeed, unfair methods of competition do not ordinarily involve such contracts or conspiracies. The effect of price maintenance being the same, however accomplished, it may well be urged that such a method of competition violates Section 5 of the Commission Act since it prevents distributors, wholesale and retail, from engaging in price competition on such goods after they have passed into their hands and deprives the public of the benefits of competition in the distribution of all such goods.

"It might also be urged that when price maintenance is approached from the standpoint of an unfair method of competition, regard must be had to its effect when employed by manufacturers rather than when employed by one, and that in this view it results in the elimination of price competition in the distribution on a vast and constantly increasing number of commodities.

"On the other hand, if the effect of the Colgate decision be to legalize the fixing and the enforcement of the maintenance of resale prices other than by contract, the desirability of the enacting of legislation recommended by the Commission becomes even more apparent. In the Commission's previous report it was stated that the unlimited power both to fix and enforce the maintenance of resale prices may not be made lawful with safety to the public. The interest of the consuming public in the enacting of such legislation is therefore more vital at this time than when recommendation was previously made."

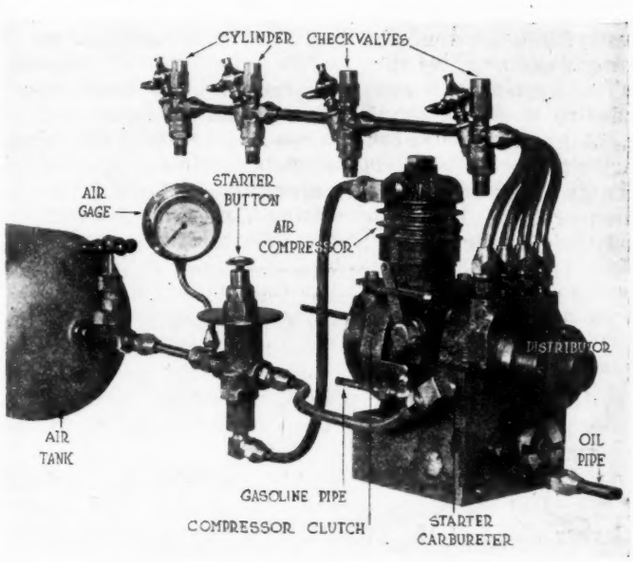
Making It Easy for the Farmer

VERY few modern farm tractors are equipped with engine starters, although it is obvious that, in view of the large size of the engines and the fact that they are often operated by boys, a starter would be most desirable. A special tractor starter has been developed by the Christensen Engineering Co., Milwaukee, Wis., and has already been adopted by one well-known tractor manufacturer as a regular article of equipment. This starter is similar to an air starter in principle, but instead of using compressed pure air for turning the engine over, a compressed explosive mixture is used. What is actually stored under pressure is pure air, but on its way to the cylinders in starting this air is charged with gasoline vapor. One difficulty with the ordinary air starter is that, if the carbureter does not give a properly proportioned and vaporized mixture, as often happens when the engine is being turned over at a low speed in cold weather, the charge may fail to ignite, and as the starter continues to crank the engine the supply of stored air becomes quickly exhausted.

This difficulty is overcome in the Christensen starter, which comprises a small air pump, a compressed-air tank with gage, a valve for controlling the flow of air, a small non-adjustable carbureter, an air distributor with leads to the cylinders of the engine, and cylinder check valves. Air is stored in the pressure tank under a pressure of 250 lb. per square inch. When the control valve is opened, this compressed air flows through the non-adjustable carbureter, where it is charged with the proper amount of gasoline vapor, into the cylinder, which is on what would otherwise be the power stroke. This forces the piston in the cylinder down. This operation is repeated in the other cylinders of the engine until the latter picks up its regular cycle.

A clutch connection is provided for the air pump so that the latter can be started whenever it is necessary to replenish the air in the tank. It is stated that with an initial pressure of 250 lb. at least 15 starts of the engine can be made without recharging. The weight of the complete outfit as applied to the Lauson "Full Jeweled" tractor is 50½ lb., made up of the following items: Starter unit, 28 lb.; tank, 12 lb.; fittings, 10½ lb.

In a test made on the Lauson tractor, fitted with a Beaver 25-hp. engine of 4½-in. bore by 6-in. stroke, and Dixie magneto ignition, the following performance was recorded: Starting with an initial pressure of 250 lb., 16 starts were made, at the end of which the pressure in the tank was reduced to 100 lb. per square inch. The drop in pressure for each start was only 9 lb. per square inch, and the average time required for each start was 1½ sec. It required 4 min. 37 sec. of pumping to restore the pressure in the tank from 100 to 250 lb. These tests were made with an atmospheric temperature of 75 deg. Fahr. The compression of the engine was 54 lb. per square inch.



General assembly view of Christensen tractor starter

How Are You Giving to Workers a Share of Responsibility?

More than 200 factory owners are taking the workers into more intimate touch with the plant than that of being mere pay drawers. There are four major plans for doing this, which Mr. Tipper describes in this article. He sets forth the salient conditions in each plan, but this is not his chief message. He says: "There must be a proper spirit behind the plan and industrial advantage must be regarded as a by-product. Lacking this, the best plan will fail."

By Harry Tipper

THE other day the director of the war camp community service in this vicinity was in to see me and, among other things, went over to some extent the vocational work which is being done for the returned soldiers. In speaking about the large attendance at these vocational schools and the earnestness of the men, he said:

> **"The interesting and impressive thing about the returned soldier is his enlarged self-consciousness. He has discovered himself and with that discovery has come a sense of power which he desires to turn into more useful and interesting work. Unless we can train him to that more interesting work, the sense of power, self-consciousness, may become a danger. Properly trained it is an advantage and progress."**

This, of course, is not true only of the returned soldier. It is true of the worker in general. The necessities of the war, the demand for sacrifice, the appeal to the patriotism, and to other ideals, and the vision of a larger and better world which was constantly held before the mind of the worker, together with the demand for his co-operation, have brought to him a sense of power, which was still unrecognized when the war broke out and, unless this power is properly harnessed in the orderly organization of industry, it will extend the difficulties which have arisen in Europe and magnify them.

The important question, therefore, is to what extent industry is visualizing this change and taking account of it. A great deal has been said and done about the necessary changes in industrial organization in the past twelve months and a great deal of attention has been forced to these problems by the increasing unrest of the workers and their demand for a larger opportunity.

> **Out of this conversation and this public attention to the problem, two plans have been adopted by industrial concerns and by Governmental bodies, the first plan dealing with measures designed to procure for the worker a larger share in the profits of industry, the second plan designed to give to the worker a larger measure of responsibility in the conduct of industry.**

The first set of plans, those which deal with the provision of organized machinery whereby the worker shall receive a larger share of the profits, vary from complete 50-50 profit sharing plans, through stock dividends and the allotment of stock to participation in departmental savings.

These plans have had a varying degree of success. None of them, without other means, have entirely solved the problem, although where they have been running for a considerable length of time and have been of sufficient importance, they have reduced the turn-over, the number of grievances and the radical action of the workers. These plans provide for the reward which forms a large part of the demands of the worker, but unless they specifically reward the individual worker or the department for special service on their part, they are not calculated to increase the sense of personal responsibility, to satisfy the consciousness of power which exists in the ranks of the workers, nor to take care of that self-discovery about which my friend of the war camp community service spoke so emphatically.

> **The desire for more proficiency which he finds among the returned soldiers is simply the subconscious desire for more responsibility translated into operating necessity. It is this subconscious desire for more individual responsibility in the economic affairs of life which is the most important and which should receive the closest attention and study.**

In the last few years two hundred concerns of varying sizes, including the largest in their lines and some of the smallest, have adopted plans which have, for their ultimate object, the transfer to the worker of a larger share of responsibility in connection with his working conditions and therefore, in some degree at least, a partnership in the conduct of industry. These plans, which belong to the second group, can be sub-divided into four general divisions:

> **FIRST, the constitutional plan.**
> **SECOND, the joint council plan.**
> **THIRD, the separate committee plan.**
> **FOURTH, the plan which takes the existing machinery of the unions.**

All four plans have been adopted and have been working for a varying length of time, from several years to a few months.

The constitutional plan was first promulgated by John Leach and has been described in AUTOMOTIVE INDUSTRIES in this series a number of times. It consists of forming within the organization legislative machinery which duplicates almost exactly the governmental machinery of the United States, including the house of representatives, elected by the workers; senate, elected from department heads, superintendents, foremen, and the cabinet composed of the officers and the general heads of the company.

It is frequently associated with profit sharing plans, and the recommendation of Leach, in these profit sharing plans, indicates that in his opinion the extra reward to the worker should come to him frequently, should be associated with improvement in his immediate department and should be the visible result of his own increased services. This plan has been referred to in the articles in AUTOMOTIVE INDUSTRIES in connection with the Prinz-Beidermann Co. of Cleveland, the Packard Piano Co., the Demuth Tobacco Co. and the Davis Silk Co. It has been adopted by about 18 other concerns.

The second plan is called the joint council plan. The joint council plan consists of a number of representatives elected by the workers, forming, with an equal number of representatives selected by the company, a committee which shall have jurisdiction over wage consideration, hours of labor, holidays and other items in which the worker is interested.

This plan was adopted four or five years ago by the Colorado Fuel & Iron Co., and has since been adopted by most of the Standard Oil companies and associate companies. It has been adopted by the Midvale, Lukens and the Bethlehem Steel companies, by the International Harvester. Important cases exist of plans which include features characteristic of both of these and which have almost duplicated the constitutional plan proposed and carried out by Leach with original modifications, as indicated in the Goodyear plan described in AUTOMOTIVE INDUSTRIES of June 26, this year.

The separate committee plan consists of one or more committees of the workers, elected by them, and one or more committees of the management, selected by the company; to separately consider these questions and come into joint action under specified circumstances whenever necessary or at regular intervals. This plan has not been used to so considerable an extent as either of the others and it seems to have come into existence as a result of special conditions in individual plants rather than as a well thought out plan of operation. It is more cumbersome in its action than the previous plans and it does not so readily bring the company and its employees into combined action and common groundwork of opinion.

The fourth plan is the plan which has been adopted to a very considerable extent by the war board in this country. It is the usual plan in Great Britain; that is, the plan of creating no new machinery for the purpose of providing a voice in the affairs of the company, but to operate on all matters in connection with wages, hours and other grievances through the local representatives of the organized unions.

This, of course, is in many respects the easiest way. It does not require the patient construction of new machinery and the development of a new point of view. It limits the discussion more definitely to certain features and it permits the manufacturer to estimate more accurately the extent to which he must submit matters connected with the running of his plant to the decision of labor. This does not mean that it is any the more effectual and it has some very grave defects.

In the first place, it presupposes that all labor in the shop is organized into regular unions and that the union is entitled to speak for all the employees. In the second place, it places the decisions and the discussions in the hands of organizations, which are not primarily interested in the conduct of the particular factory or business, but rather primarily interested in the position and power of labor as a class.

These defects make it impossible in this country to consider it as an effectual plan, where organized labor does not begin to include the total laboring body in any but a few of the trades. Perhaps the worst defect of this plan is the fact that it does not consider the questions at issue from the standpoint of the company and its employees as a unit but must, of necessity, consider these questions from the standpoint of the organizations of the various occupational unions involved; and the decision on the grievance may be deferred, or its value destroyed, by the difficulty of agreement between the occupations as to their position in the matter.

This difference is emphasized because there has been a disposition in the public discussion of the Whitley plan, recommended in England, to see in this plan a similarity to the shop committee or joint council plans which have been formed by a number of business organizations in the past three or four years.

The Whitley plan operates entirely through the local representatives of the different occupational unions which form the Allied District Trades Council and does not recognize in any of its considerations the necessity of providing some means to take care of the worker who does not belong to such a union.

The joint council systems, which have been adopted in this country, recognize the employees of the company as employees and in their developments do not differentiate because of membership of occupational unions.

This difference is fundamental. The occupational unions, as at present organized, are interested more largely in the condition of labor as a class than they are in the condition of the employees of any particular company, and it is necessary that they should be so interested. They have a very definite and vital value in the general affairs which surround labor, and they have performed a great service to labor in their growth and development. They cannot bring together in common connection the employer and the employee, because of the limitations of their constitution and the necessities of their outlook. Employers and employees must treat together as members of the same organization and as concerned with the growth and development of that particular business, if the proper responsiblity is to be given to the worker and soberly exercised by him.

It is, furthermore, necessary that employers and employees should get together through some form of organization as such, if the worker is to recognize any allegiance to the organization for which he is working and not continue to consider that his whole allegiance is to his occupation and its demands.

The fact that 200 concerns in this country have adopted plans which look to the provision of a larger share of responsibility for the workers and to that extent recognize his power, his demand for responsibility, is encouraging; but the success of the plan depends entirely upon the ability of the manufacturer to imbue his workers with confidence in his desire to deal squarely and openly with them, and only as this is accomplished will the plans be of any importance.

Perhaps the greatest element in the success of Leach in his work with the concerns that have adopted the constitutional plan has been his ability to keep the management of the company and the workers both on a basis of confidence in each other. **There has been so much chicanery on both sides,** that it is not easy to secure the measure of complete confidence that is necessary for the working out of these plans.

The industrial advantage of such plans will come entirely as a by-product of the moral and ethical standards from which they are operated. **It is far more important to be truthful and square in dealing with the workmen than it is to be truthful and square in dealing with the customers.** We have recognized the latter for a long time. The adoption of these systems indicate that a number of manufacturers are recognizing the former.

AUTOMOTIVE INDUSTRIES
The Automobile

PUBLISHED WEEKLY
Copyright 1919 by The Class Journal Co.

Vol. XLI Thursday, July 24, 1919 No. 4

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
U. P. C. Building, 239 West 39th Street, New York City

BUSINESS DEPARTMENT
Harry Tipper, Manager

EDITORIAL
David Beecroft, Directing Editor
Clyde Jennings, Managing Editor
P. M. Heldt

DETROIT OFFICE
J. Edward Schipper

WASHINGTON OFFICE
Allen Sinsheimer

BRANCH OFFICES
Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—95 Fort Street, West, Phone Main 1351
Cleveland—Guardian Bldg., Phone Main 1142
Philadelphia—Widener Bldg., Phone Walnut 5601

Cable Address - Autoland, New York
Long Distance Telephone - 8760 Bryant, New York

SUBSCRIPTION RATES

United States and Mexico - One Year, $3.00
Extra postage west of the Mississippi River on account of Zone Postage Law, 0.50
Canada - One Year, 5.00
Foreign Countries - One Year, 6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; W. H. Taylor, Treasurer; A. C. Pearson, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Commercial Aviation's Need

THE United States should develop a commercial aviation program promptly because:

(a) The aeronautical industry is going to be an important industry and, having its origin in this country, should be, rightfully, an American industry.

(b) Commercial aviation is going to cut mail and express time to all corners of the globe and become an important factor in foreign trade.

(c) Our army will soon resume a peace-time basis and will reduce its aerial activities. This country must then depend upon a potential aeronautic power rather than an established military one. The potential power for military aviation lies in a well established aeronautical industry, and this in turn can only thrive with the development of commercial aviation.

The reasons are sufficient for action. Eight months have passed since the end of the war gave notice of changing conditions, and yet commercial aviation in the United States has made but little progress.

Prompt action is needed if this country is to have the prosperous industry, the aid to foreign trade, and the insurance against unpreparedness that lies in well established commercial aviation.

Extension of the Milling Process

IN the machining of metals the old practice of using a single cutting edge, as represented by lathe and planer tools, is constantly giving way to the milling process where a multiplicity of cutting edges is used which come into action in turn. The cutting speed with any tool depends largely upon the rate at which the tool can dispose of the heat generated. If a single edge cuts continuously, it is subject to a steady heating effect and there is slight opportunity for the heat to escape. On the other hand, if there is a multiplicity of cutting edges, as in a milling tool, each coming into action momentarily, then to be removed from the cutting surface for an interval materially longer than the cutting period, the cooling facilities are much greater; the tool can be run at higher speed without danger of overheating and, besides, it will stand up much longer.

An excellent example of the ascendancy of the milling process is the surface milling of the flats and bosses of machinery cases. Twenty years ago this operation would have been performed in a planer, and it is hard to imagine a more tedious process. To-day a considerable number of cases are clamped down to the carriage of a large continuous milling machine and have their flat surfaces in both the horizontal and vertical planes and possibly surfaces at different levels milled in one operation.

To-day practically all flat work in regular manufacturing operations is performed in milling machines, and it now looks as though the next development would be the application of milling to cylindrical work. Thus a process has been developed for cutting screw threads by means of milling tools and now a machine has been perfected for finishing all the pins of a multi-throw crankshaft in a single milling operation. With high speed steel, a copious supply of coolant and the use of revolving cutters with multiple cutting edges, the machining of steel parts and even those of the harder grades of steel has been rendered far easier than it was two decades ago, and the result is that even though the wages of labor have more than doubled the prices of automobiles have not gone up on the whole.

Exit—The Cheap Car

THERE is no longer room in the industry for the car built solely to sell. The cheap car, the big car for the money, the product that hurt us abroad as much as it did at home has no longer a place in the field. Mushroom concerns that spring up overnight, and go to seed after a brief period of misrepresentation are a thing of the past.

The changed conditions brought about by the war make it impossible for a concern to succeed even for a short time with this policy. In future, greater

value must be given and a concern to be a success must build with the idea of permanency. We have come to the realization that it is better to add a few dollars to the selling price and to put that added value into materials and workmanship. Specification shaving is not the method of acquiring success.

It is one of the most encouraging phases that we have ever encountered. It is gratifying to study the specifications and the quality of the material that is coming out in the 1920, the post-war cars. Alloy steel of the best quality, dimensions that mean value, are the rule and not the exception. The best in upholstery, enlarged crankshafts, tolerances paralleling those of airplane manufacture and other indications of the practice of building as well as possible are characteristic of most of the new products.

Trade-Mark Piracy

AN interesting development in business literature is that which includes the increasing number of pamphlets devoted to "Trade-mark Piracy" in many countries, especially those of Latin America. It develops, now that many automotive manufacturers are earnestly seeking export trade for the first time, that they cannot use their locally well established trade marks where they wish to sell. While Americans were indifferent as to export trade, enterprising merchants in other countries registered these trademarks as their own.

The laws of these countries are such that a trade mark is registered as the property of the man or firm first presenting it for register, regardless of its registration or use in other countries. There apparently has been no protective legislation of this sort in most of the countries that import heavily.

As a result of this registration of trade marks in other countries by firms trading in those countries, the American manufacturer has this choice:

The creation and registration of an entirely new trade mark for export trade.

Buy the trade-mark rights of the man or firm owning the rights in the country in which he wishes to sell.

Make the local firm owning his trade mark his agent in that country.

With most of those who have registered American trade marks in other countries, the idea appears to be that this would give to them the first opportunity to become agents there for this article of merchandise when it entered that country. With others, the registration was completed by the local man with a view of selling back to the American his own property. This form of graft is not peculiar to any section or line of business.

The situation is rather a reflection on the vision of American business men. It must be admitted that they lacked the imagination that marks the business men of some countries. It is unfortunate for the trade that the Americans did not so believe in their own output to the extent that, in its infancy, they dreamed of seeing their products used the world over and at once took the necessary steps to protect it as such.

It is not that the American lacks confidence in his output, or that he believes that any one else is going to build a better article. But his vision of the future was confined by the Arctic, Atlantic and Pacific oceans and the Gulf of Mexico. He mistook the continent for the world. Apparently he could not think in terms of knots and ships. The water haze blinded him. He has been an inlander and he must admit provincialism.

There is one feature of this that is not entirely unfortunate. Every export investigator says that most American trade marks, excellent and expressive in this country, are utterly expressionless in foreign countries. Perhaps there may be some balm in that. The American can create an export trade mark that will express the same thing in other countries.

But the situation is here. There is little legal help for it. The foreigner has first seen the opportunity and he is within the law. The American must accept the situation and make the best of it. But the lesson is here for those whose trade marks have not been stolen. Get a broad vision of your future business and protect your rights before some one robs you of them because they can dream bigger dreams of your possibilities than you do.

There has been created a corp of international trade-mark experts who are at your service. Also the Bureau of Foreign and Domestic Commerce of the U. S. Department of Agriculture is giving some excellent advice on the subject of foreign trade marks. Look to the future and protect your own business.

Accidents to Dirigibles

THE several accidents to blimps and dirigibles that have occurred recently emphasize the danger involved in this type of aerial vehicle as long as a highly inflammable gas is used for inflation. We have heard a good deal about helium recently, and how means had been found of producing it on a commercial scale at reasonable cost. Undoubtedly the cost is still considerably greater than that of hydrogen, but the immeasurably greater safety afforded by the inert gas should set aside whatever objections there may be to the use of helium on the score of price.

We know from conversation with the crew of the R-34 that during their trip across the Atlantic they lived in constant fear of an explosion which might have been caused by atmospheric electricity or through the negligence of some one. The several accidents on this side of the water serve to show that their apprehension was not without reason.

The double transatlantic flight has brought the lighter-than-air machine prominently to the attention of the public and has created a belief in commercial possibilities of this type which might be realized in the near future. But a few more accidents like those of the past week will undo all the favorable propaganda work of the overseas flights of the R-34. Before the public can be induced to take a serious interest in these machines they must be shown to possess a tolerable degree of safety, and it is therefore highly desirable that the practical use of non-inflammable gas be inaugurated as soon as possible.

Engineers Will Study Captured German Trucks

S. A. E. and N. A. C. C. to Join Forces for Exhibit of Ordnance Equipment

Vehicles at Camp Holabird to Be Put on Display as Aid to Designing

NEW YORK, July 24—German army motor trucks brought to this country as captured war material and motorized ordnance equipment of the United States forces are to be made available for a comprehensive study by American automotive engineers, under a plan being worked out by the National Automobile Chamber of Commerce and the Society of Automotive Engineers.

It is proposed to hold an exhibition, lasting probably a month, of the German vehicles now concentrated at Camp Holabird, Md., at the same time assembling for the engineers' observation the various types of Americian army haulage machines. With the co-operation of the Army Transport Corps, said to be anxious to make the equipment in its charge available for study, it is expected that the exhibit can be housed at the Maryland camp, in a government building at Washington, or in one of the automobile centers of the Middle West.

Forty-seven German Makes

Directors of the N. A. C. C. discussed the project at their recent meeting in Buffalo, pointing out that the industry might profit by study of the forty-seven makes of German trucks shipped here from the battlefields. Conceding that a majority of the trucks were out of date, the manufacturers felt, nevertheless, that some of their construction features might offer suggestions worth the consideration of American designers. General inspection of the United States ordnance vehicles, as well, would be profitable, they agreed, and Alfred Reeves, general manager of the Chamber, was instructed to consult with the S. A. E. regarding the proposed exhibit, offering the services of N. A. C. C. workers, as well as a financial contribution, to help carry out the plan advanced.

Complete Plans in Fall

Reeves conferred with Coker F. Clarkson, secretary of the S. A. E., suggesting that the exhibit be held under the engineers' auspices, and tentative plans were made for a meeting to bring the proposition forward to a definite stage, which probably will be reached after Labor Day.

Clarkson said the S. A. E. already had inspected the German truck collection, adding that the Motor Transport Corps had indicated a willingness to make the vehicles available for study by an S. A. E. committee and by engineers generally.

ARMY CONTRACTS LIQUIDATED

WASHINGTON, July 19—The value of uncompleted portions of suspended contracts liquidated to June 28 totals $1,483,826,000, according to a report issued to-day by the War Department. This is 41.6 per cent of the total suspensions, which amount to $3,567,340,000.

Four hundred and twenty-six contracts were liquidated in the week ended June 28, and a total of 18,318 up to that time. The savings arising from the contract liquidations follow:

Value of uncompleted portions, $1,483,826,000; amount paid contractors in settlement, $204,668,000; savings effected, $1,279,158,000; savings in per cent of value of uncompleted portions, 86.2.

Ordnance contracts awaiting liquidation total 75 per cent of all contracts and 10 per cent relate to the Air Service.

1,164 Michigan Companies Formed in Six Months

LANSING, July 21—During the first six months of the year 1164 new companies were incorporated in Michigan. These companies have a combined capital stock of $202,750,000. In addition to the new organizations just starting, 287 concerns increased their capital stock.

For the first six months of last year the state department authorized 796 new corporations and sanctioned the increase in the capital stock of 270 old companies. Most of the new companies of 1918 were organized for the manufacture of war material. Of the companies organized this year 33 per cent represent firms about to engage in the metals manufacturing and automotive trades and 50 per cent real estate and building companies.

G. M. C. Condemns Building Inactivity

FLINT, MICH., July 21—Walter P. Crysler, first vice-president of the General Motors Corp. and president of the Buick Motor Car Co., in a communication sent to the Board of Commerce, declares the demand for houses in Flint is not being met, and asserts that measures must be taken to meet the demand or it will be necessary for General Motors to completely revise its expansion plans. The General Motors Corp. is building 1000 homes where the demands call for 7000 this year and several thousand more next year.

STROMBERG TO ENLARGE

NEW YORK, July 21—Stockholders of the Stromberg Carbureter Co. of America will meet in August to pass upon the directors' recommendation that the capital stock be increased from 50,000 to 75,000 shares. It is proposed to offer the new shares to present stockholders at $45 each. Allan A. Ryan, banker and president of the Stutz Motor Car Co. of America, as well as a director of the Stromberg company, has formed a syndicate to underwrite the expansion.

Government May Cancel Truck Tax

N. A. C. C. Hopeful of Change in Revenue Regulations by January

NEW YORK, July 22—Manager Al Reeves of the National Automobile Chamber of Commerce expressed the hope to-day that the government would remove the special revenue tax on trucks—3 per cent of value—by Jan. 1. Reports from the chamber's Washington bureau, he said, gave no hope of lifting of the passenger car and parts taxes, owing to the government's revenue needs.

The chamber had given up hope, Reeves added, of inducing the department to collect taxes on parts from dealers, rather than manufacturers, a change which would have eliminated much unnecessary bookkeeping and done away with inequalities in passing the tax on to the consumer, which are unavoidable under the present plan.

Strong Hope Held Out For 1920 Glidden Tour

NEW YORK, July 22—The proposed revival next year of the Glidden tour is scheduled for consideration at the midwinter meeting of the A. A. A., by which time it is believed manufacturers will have been sounded out as to their inclinations to enter cars in a cross-continent tour.

The A. A. A. touring bureau already has mapped out a tentative route, from New York to San Francisco, over which it is believed the running time, taking into account local speed laws and regulation, night and meal time stops, would be three weeks to a month.

The committee headed by Richard Kennerrell of the A. A. A. contest board sees no obstacle to the tour outside of a possibility that the manufacturers, hard pressed to keep production up to demands—if this condition continues into 1920—may not see their way clear to prepare cars and crews for the run and foot the operating bill, running into several thousand dollars. However, the committeemen look for a stabilizing of the industry before next fall, and have strong hopes of conducting the tour, with a large field of entrants.

NEW ASBESTOS TIRE CO.

PEORIA, ILL., July 21—The Central Perfection Sales Co. has been incorporated with a capital stock of $500,000 and will manufacture and distribute Perfection asbestos tires in Illinois, Missouri, Indiana, and Iowa. C. W. Beran, of Bloomington, Ill., and Harry W. Keith and A. W. West, both of Peoria, Ill., are incorporators. W. B. Smith, formerly with the Goodyear Co., has been appointed sales manager.

S. A. E. Toastmaster Flies to Dinner

Kettering Favors Commercial Aviation and More Practical Tractors—Other Addresses

WICHITA, July 17 (*Staff Correspondence*)—After achieving the distinction of being the first toastmaster to travel by airplane from his home to a dinner, Charles F. Kettering, past president of the Society of Automotive Engineers, gave voice to his views on the future of aviation and agriculture.

"It is impossible," he said, "for us to project from our pre-war experiences what is going to be the experience of the future. A new baseline from which to make calculations is needed. The war, having brought the boys from the north, south, east and west together, has enabled each to create a new picture of the future, and engineers and business men must take a broader view of what is to come.

Development Necessary

"In the development of the tractor we have not reached the time when the expenditure of money and time for developments must cease. It is just as important for the farmers in Ohio to know what tractors will do on the farm as for the farmers of Kansas to know what they will do in Kansas. There must be more local demonstrations.

Farmers' Needs Important

"The automotive industry has given to mankind a wonderful thing in putting in the hands of the farmer a detached power plant with which he can do what he wants, but more recognition must be given to the work the farmer has to do with it. The manufacture of machinery must be treated on a new basis, with the dominant thought of giving to the farmer more of what he wants.

"We did not fly from Dayton here, 800 miles, to perform an airplane stunt, but to demonstrate the practicality of this new method of travel. The economy of the business man's life makes it as necessary to-day to take the airplane as it was to drop the mare and buggy and use the motor car twenty years ago.

Farmers Need Convincing

"Nothing is so inert as the human mind. It does not want to change. Before leaving Dayton by airplane for Wichita we came from Philadelphia by railroad on a train going through Dayton to St. Louis. We got off the train in Dayton and went to our home, packed a grip and then went to the flying field and took the plane and we were in Wichita two hours before that same train had reached St. Louis."

Governor Allen of Kansas, another speaker, regretted that 50 per cent of the Kansas lands were owned by absentee landlords, a fact which he said was holding back the more general adoption of the tractor. The state, realizing the seriousness of the absentee-landlord problem, is preparing to assist the tenant to get possession of land.

E. T. Gittins, of the J. I. Case Threshing Machine Co., spoke for quality in tractors as the most needed essential. Not only must the machine be of first quality but it must also be of practical design, capable of doing in a practical way whatever the farmer has to do. The development of this practical tractor is the hardest problem ahead of the maker. In doing it the problem must be considered from the standpoint of the farmer. The tractor cannot be made of too high quality. Its mission is to raise more and better crops with less labor. We

(*Continued on page* 189)

Ford Managers May Hear Price Increase

DETROIT, July 22—Branch managers of the Ford Motor Co. are in convention here this week. Forty-three members from the United States organization and eight from Canada are in attendance.

There are many important matters concerning policy to come up. It is stated that the present business policies as vitally concerning the managers and dealers organizations will not be changed in any way, but may be enlarged and broadened in many respects.

Whether the Ford company, following the example of other automobile concerns, will raise the price of its product when it starts its new fiscal year, July 31, will be made known to the managers. There have been rumors in Detroit that Ford was about to increase the price of all models, but company officials have stated only that a new Ford price will be made public within ten days and may include a $75 increase on all models to cover the cost of a self starter, which will become a part of the standard equipment of the 1920 machine.

The managers have been informed by the company that as soon as starter production equals car production all machines will be thus equipped, but at present the company is able to secure only enough starters for its sedans and coupes.

Shipping Board Opens 62 Commerce Lines

NEW YORK, July 23—The United States Shipping Board announced today that it had 829 ships of 4,248,973 deadweight tonnage operating on sixty-two regular freight lines and in general cargo and tramp service, reaching every quarter of the globe. This shipping is exclusive of more than 2,500,000 tons still in army, navy and overseas civilian relief service.

Ships assigned to regular cargo lines, from American ports, with sailings ranging from weekly to monthly, follow:

To South America, 81; to Africa, Egypt and the Orient, 37; to Europe, 76; to West Indies, 10.

Most of the freighters have a speed of ten to twelve knots.

Aircraft Mission Back from Europe

Report Expected to Influence Government Attitude Toward Future of Industry

NEW YORK, July 23—Fortified with facts and figures on the aid given commercial aviation by European governments, the American Aviation Mission, headed by Assistant Secretary of War Benedict Crowell, arrived here this week on the Aquitania after a six weeks' investigation tour abroad. The mission brought a completed report, which awaits the authorization of Secretary of War Baker for publication and presentation to Congress.

Before his party sailed late in May, Assistant Secretary Crowell declared he was inclined to believe some sort of government assistance would be necessary to assure continued production of American aircraft. Whether his views were altered or strengthened as a result of the mission's investigations in Great Britain, France and Italy, Crowell declined to say, stating that publication of the mission's findings must await word from the Secretary of War. Baker and Crowell had a long conference on the latter's return to Washington, after which the Secretary refused to comment on a report that he would recommend to Congress creation of a Department of Aeronautics, with a Cabinet officer at the head. Baker declared, however, that the situation in the Army Air Service, rapidly approaching a state of demobilization, was "very serious."

The Secretary added that the aviation problem would be taken up with the national legislators as soon as the military committees were ready to tackle it. In this connection the new joint Army and Navy Air Board held its first meeting early in the week in the War Department.

With the Crowell mission, aside from the government representatives, were S. S. Bradley, general manager of the Manufacturers' Aircraft Association; George H. Houston, president of the Wright-Martin Aircraft Corp., and C. M. Keys, vice-president of the Curtiss Aeroplane & Motor Corp. Bradley stated that there would be no discussion of the tour or the report resulting from it until the report had been made public.

Government members of the party were Capt. Henry C. Mustin of the navy, Col. Halsey Dunwoodie and Lieut. Col. James A. Blair of the army, and Howard E. Coffin of the Council of National Defense.

CANADIAN FORD DIVIDEND

DETROIT, July 20—The Ford Motor Co. of Canada has just paid a dividend of 10 per cent on all stock of record July 16. This dividend makes a total of 25 per cent paid so far this year by this company.

Passenger Cars Rare Luxuries Among Italians

War Abolished Them and Automobiles Now Are Scarce Except in Factory Centers

W. C. Marshall, U. S. Investigator, Finds Italian Production Slow in Reviving

NEW YORK, July 23—The war abolished the passenger automobile in Italy. It did the job so thoroughly that, with the armistice more than six months removed into history, touring vehicles, except in the automotive production centers of Milan and Turin, are a rare sight. And with restrictions standing against automobile imports and the output of the Italian factories limited by the high costs of raw materials and out of date operating methods, the chances are not bright for immediate attainment by Italy of a position of importance in the world's low priced automobile market, nor of resumption in that country of pre-war merchandising conditions.

Visits Fifty Factories

These are the conclusions of W. C. Marshall, mechanical and civil engineer and former captain in the United States Army Ordnance Division, who has returned here after a three months' tour of Italian manufacturing centers in the interest of the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

Going to Italy to investigate the industrial machinery market, Marshall, who is a member of the Society of Automotive Engineers, visited fifty Italian manufactories. Among them were the Fiat, Lancia, Bianchi and Isotta-Fraschini automobile plants.

Marshall found the output of the automotive factories small as compared with plants of similar size in America. There was lack of system, he said, poor design in jigs and fixtures, a tendency to low speed in machine tools and a general absence of the multi-operation equipment which speeds up American production.

Fords at 12,000 Lire

Marshall's observations of motor transportation conditions in Italy were equally interesting. Passenger vehicles were few, he asserted, because of the restrictions on imports, the small output of the Italian producers and the excessive cost and difficulty of obtaining gasoline. As an instance of the car scarcity he cited the market valuation of Fords—12,000 lire, or $1,040 at the present rate of Italian exchange—adding that they were difficult to get at that price, their importation being prohibited.

Describing his trip through the Italian production fields, Marshall prepared the following statement for AUTOMOTIVE INDUSTRIES:

"During the war all pleasure automobiles disappeared from the roads and streets in Italy, their place being taken by camions, Red Cross, Y. M. C. A., government and munition plant cars. Gasoline was obtainable by permit only and a limited quantity of that. All the automobile plants were utilized for making munitions, camions and motors for airplanes or marine purposes, and no cars were made for pleasure purposes. As late as June 30 some of these plants were still working on war orders and were prohibited from making automobiles for private sales until the government orders were filled.

"As a result of this restriction and the limitation of automobile imports it is difficult to buy an automobile in Italy even at an excessive price. Gasoline varies in price from 80 to 95 cents and $1 per gallon and permits are necessary for its purchase. Comparatively few automobiles are running except in the cities of Milan and Turin, where the principal factories are located. A Ford car is worth 12,000 lire and is hard to get at that price, for their importation is prohibited.

"The writer visited four of the principal factories and found them all busy, although not running as many hours as during the war and with a reduced force of employees.

"The first plant visited was the Isotta-Fraschini on the outskirts of Milan. The buildings are all of one story, with saw tooth roof and skylights, and are paved with wooden blocks. Electric power is used exclusively. Shop transportation is

(*Continued on page* 192)

After-the-War Conditions in Italian Automobile Industry

Passenger cars practically non-existent, except in Milan and Turin, automobile factory centers.

Operation of motor vehicles restricted by high cost of gasoline —85 cents to $1 a gallon—and necessity of obtaining permits for its purchase.

Buying of cars difficult, even at high prices, owing to low production of Italian factories and restrictions on importations of foreign makes.

Fords worth more than $1,000, and hard to get at that price.

Italian automobile plants operating with reduced forces, and output is small, compared with American industry, owing to lack of system, poor design of fixtures and low speed of machine tools.

Italy will remain a minor factor in low-priced car manufacture until production methods are improved and material costs reduced.

—Observations and conclusions of W. C. Marshall, investigator of the Bureau of Foreign and Domestic Commerce.

British Car Tariff Likely to Continue

Restrictions Will Come Up for Consideration Soon—Second-Hand Demand Continues

LONDON, July 8 (*Staff Correspondence*)—It is understood from an answer in the House of Commons this week that the Government has decided to continue the tariff on imports (including motor vehicles) until the end of the (British) fiscal year, April 30, 1920.

The more important matter—the question of the removal of the present restriction on the number of imported vehicles—will come up for review on Sept. 10 next. It is stated that the Government has a revised fiscal policy ready and waiting to be announced, and in some quarters it is believed that the opportune moment for it is likely to occur with the advent of the next general election, which cannot be long delayed, and which is expected to take place in the middle or late autumn of this year.

An election is considered desirable and is even desired among non-politicians as a means of redressing the present too unequal balance of parties. Government by Coalition is tantamount to ruling by ministers and departments, as witness the present fiscal ruling, which has virtually turned Great Britain from a Free Trade country into a highly protected one without a mandate from the electorate.

Meanwhile, as regards motor cars, matters seem no better, the ramp in second-hand cars continues, but the wiseheads expect a wholesale slump in prices at the end of the touring season. Doctors are loudly complaining of being unable to obtain new cars necessary for their business, and have advanced a plea for special recognition of their case by the Government. The whole situation is chaotic, and the more intolerable because it is the outcome of a system which is quite opposed to normal British trading policy and tradition.

German Car Imports From U. S. Before War

WASHINGTON, July 21—Preparations for resumption of trade with Germany has called attention to the records of exports to that country for the year ending June 30, 1914, which is the last peace time record. During that year 1411 passenger cars, valued at $1,041,000, were shipped from the U. S. to Germany.

SELDEN CO. INCREASES STOCK

ROCHESTER, N. Y., July 19—Plans by which the Selden Truck Sales Co. f this city will increase its capitalization to $1,300,000 were announced here to-day by George C. Gordon, the president. A meeting of the board of directors will be held July 30, when plant enlargements will be considered.

Big Selling Plan Stirs British Trade

Some of Critics Believe that $10,000,000 Company Means End of Small Man

LONDON, July 8 (*Special Correspondence*)—The reported progress of the British Motor Trading Corp. is attracting attention in England, alike in public and trade circles. The public, or at least a section of it, see in this corporation a big effort forward towards improving the quality of repairs and increasing garage service.

The trade here is beginning to fear more than ever that the inevitable result of the strengthening of this trading corporation will be the gradual extinction of the small garageman. Other critics believe that the policy of the corporation will prove to be too big, and that the large capital—$10,000,000—is being spent not wisely but too rapidly. Color is given to this impression by the costly deals already undertaken by the corporation. For instance, it is being credited with having bought the North of England Motor business of Sir William Angus Sanderson, at a price undisclosed, and also the business of G. Heath, Ltd., of Birmingham, in this case for $1,250,000. These deals give the corporation valuable interests in Newcastle-on-Tyne, and the North East English coast districts, and Birmingham for the Midlands, respectively, and it is believed, that the purchase of a large Manchester business will shortly be carried through.

Service is the watchword of the new company, and the promoters have caused it to be published that the ability and willingness of the small dealers to respond to the service ideal will decide the trade future of many of these people. It is reported, too, that this corporation has bought the English distributing rights in the new Glasgow farm tractor, a comparatively untried machine, which was seen at the recent Royal Agricultural Show for the first time. Personally I fear for the success of the corporation because of the large sum it is credited with disbursing both in enterprises of the sort named and in becoming so closely allied with the Crossley car interests, having placed an order for more than $5,000,000 worth of that make of car. We have a saying here warning people from "placing all their eggs in one basket."

HEAVIER SHIPPING TO RIO

WASHINGTON, July 19—American ships arriving at Rio de Janeiro during 1919 show a large increase over former years. From May 1 to May 23, nineteen vessels of American registry entered and, since Jan. 1, seventy-four entered, sixty-three of which came directly from the United States. These figures compare favorably with 1918, when only 71 American vessels arrived there during the entire year.

Bottoms for return cargo to the United States at present are plentiful, with little or no opportunity to fill sailing space. There are at present at that port twenty-two Norwegian sailing vessels under charter by the United Sates Shipping Board, with very little chance of securing cargo for the United States.

Demand for American Cars Heavy in Spain

DETROIT, July 18 — Detroit-made automobiles dominate the market in Spain, says Luis Carreras, an automotive engineer of Barcelona, who is in this city to study factory methods and to investigate prospects for an early expansion of Spanish-American trade.

Danger of political and social upheaval in Spain is no longer imminent, he declares. For a time the unrest was acute, but business conditions have improved greatly and discontent has waned proportionately. The demand for American-made automobiles is excellent. The dealers in the larger cities have more orders than they can fill and the demand is continually on the increase. This has been noted especially so since the armistice.

The medium and heavy cars are proving the most popular. The various American makers who have regular connections are doing the most business largely in proportion to the steps they have taken to establish themselves with the Spanish public.

Carreras expects to make a short tour of America before returning to Spain.

RESUME EUROPEAN PRODUCTION

NEW YORK, July 19—Resumption of production by the International Harvester Co. at its plants at Croix, near Lille, France, and at Neuse, Germany, was forecast here by an announcement that these plants had been kept in good condition during the war.

Plague of Inferior Castings in England

Trade Situation Has Become a Serious Problem for the Industry

LONDON, July 8 (*Special Correspondence*)—Complaint is rife all round, but more especially among firms who buy their cylinder castings, of the marked inferiority since the war of cylinder castings. As high as 60 per cent of wasters and discards are reported in some cases, and one firm has found it advisable to triplicate its orders for cylinders for a given batch of output.

Before the war, Belgian and French cylinder castings were supplied here in large quantities at less than $10 for a small four cylinder block. Probably the present price of a similar casting, thanks to the suppression of imported castings, is double, so that besides the factor of an increase of 100 per cent for the casting, there is a *pro rata* increased cost of machining besides, and a 2 or 3 to 1 chance of wasters and, as usually happens, waster castings only reveal themselves during machining, so that the initial cost is considerably increased by machine-shop and overhead charges.

As all the cost ultimately is borne by the public, an item of this sort may easily be a perpetual handicap to the expansion of business in British cars, and such a handicap is felt most in the overseas market, where the British product has to meet American and other makes.

I have not heard what is the cause of these unsatisfactory castings, but incline to the view that there is a shortage of the necessary hematite ore for this class of casting.

Motor cars in the historic courtyard of the Palace, Versailles, France. On the balcony, immediately behind the cars, Louis XVI and La Fayette appeared before the crowd in 1789, *just before leaving Versailles for Paris, during the French Revolution. The cars are: Panhards, the new Delage and Fiats*

Fire and Chassis War Taxes Changed

Treasury Department's Rulings Clarify Situation That Puzzled Manufacturers

WASHINGTON, July 22—Revision of that section of the Revenue Bill under which war taxes are levied provides for the sale of tires, inner tubes and motor vehicle parts to manufacturers for use in construction without tax, a request which was urged upon the Treasury Department by the industry.

Also the definition of a chassis has been changed and a provision made for its eventual use, which reduces the tax 2 per cent under certain circumstances.

The changes in the act, announced today by Commissioner Roper, follow:

Resale of parts by automobile manufacturer: Where an automobile manufacturer prior to the issuance of Regulations 47 (May 1, 1919) billed as a separate item and collected tax upon the resale of parts to dealers and it is impracticable to adjust the tax in accordance with Regulations 47, the total amount of the tax collected by him should be paid to the collector. The actual manufacturer of the parts will be held to be exempt from tax upon such sales provided he has on file a certificate from the automobile manufacturer to the effect that the parts purchased by such manufacturer from February 25, 1919, to the date of the issuance of Regulations 47 had either been used in the manufacture of new cars or will be so used, or that the tax upon such parts theretofore sold by the automobile manufacturer will be paid directly to the collector.

Article 14 of Regulations No. 47, entitled "Tires, inner tubes, parts, and accessories sold to manufacturer" is hereby modified to read as follows:

"Subdivision (3) of Section 900 of the Act exempts from tax sales of tires, inner tubes, parts, or accessories to a manufacturer or producer of automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories. To come within the exemption the sale must be to such a manufacturer for use by him in the manufacture or production of automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories or for sale by him on automobile trucks, automobile wagons, other automobiles, or motorcycles, or in connection therewith or with the sale thereof or for free replacement under contract or guaranty. If sold to such a manufacturer for any other purpose, such as resale to a dealer or for the rebuilding of used cars, the sale is taxable. In order for the sale to come within the exemption of the statute, the manufacturer must at the time the goods are shipped or sold (whichever is prior) have in his possession an order or contract of sale, with certificate of the purchaser in writing printed thereon or permanently attached thereto, showing that the tires, inner tubes, parts, or accessories so purchased are to be used in the manufacture of new automobile trucks, automobile wagons, other automobiles, motorcycles, tires, inner tubes, parts, or accessories or for sale on automobile trucks, automobile wagons, other automobiles, or motorcycles or in connection therewith or with the sale thereof or for free replacement under contract or guaranty."

Following is a form of the certificate or statement which will be accepted:

FORM OF CERTIFICATE

The undersigned hereby certifies that the tires, inner tubes, parts, or accessories purchased hereunder are purchased with the intention of using them in the manufacture or production of new automobile trucks, automobile wagons, other automobiles motorcycles, tires, inner tubes, parts, or accessories, or for the sale on new automobile trucks, automobile wagons, other automobiles, or motorcycles, or in connection therewith or with the sale thereof, or for free replacement under contract or guaranty. In case any of the tires, inner tubes, parts, or accessories sold hereunder are diverted from this use, the purchaser will account for such tires, inner tubes, parts, or accessories to ——————, the manufacturer thereof, at least once during each calendar year and will pay the tax thereon to him at the time such accounting is made.

"Signed——————

If it is impracticable to furnish a certificate for each order a certificate covering all orders between given dates (such period not to exceed a month) will be accepted. If in any case such an order and certificate cannot be produced on demand of any authorized agent of the department the tax in respect to the sale will be considered in default.

Substitute in place of the next to last sentence of Article 15 of Regulations 47, which reads as follows:

"A chassis is a part of an automobile and taxable at the rate of 5 per cent when sold separately, regardless of whether it is a chassis for an automobile truck or wagon or for any other kind of automobile," the following:

"A chassis provided with a superstructure of such design that it is without substantial additions adaptable for hauling heavy loads is an automobile truck or automobile wagon and taxable at the rate of 3 per cent. A chassis not so equipped is an 'other automobile' taxable at rate of 5 per cent. Unless the manufacturer has actual knowledge that the chassis is to be used as an automobile truck, or automobile wagon, or has in his possession at the time the chassis is shipped or sold (whichever is prior) an order or contract of sale with a certificate of the purchaser in writing, printed thereon, or permanently attached thereto, showing that the chassis specified in the order is to be so used, the tax shall be 5 per cent upon the manufacturer's selling price."

Gnome Will Continue To Build Air Motors

PARIS, June 28 (*Staff Correspondence*)—The Gnome and Rhone Aviation Motor Co. will remain interested in the production of aviation engines, according to a statement made at the annual general meeting just held here. A dividend of 250 francs per share was paid—deducting taxes the net amount per share is 237.50. At this meeting, it was pointed out that the year 1918 was very disturbing for the first four months, production having gone on normally and at an increasing rate. When the German long-range guns began to bombard Paris and aerial raids became numerous, the government requested the company to move their works to the provinces as quickly as possible. This was done not only on account of the feared damages to the buildings, but because of the fact that workmen might leave Paris for their personal safety, thus limiting output. Two new factories were acquired at Tours and at Lyons. As all other Paris factories, at this time, were anxious to secure new works away from the capital, and as the government was insisting on greater output, this change was difficult to carry out.

When the armistice came most of the aviation engine contracts were cancelled. At the same time, the factories were requested not to discharge their work people unless absolutely unavoidable. During the war, the stress had been so great that it had been difficult to prepare a peace program, with the result that little had been done for putting the works on a commercial basis. The company is now interested in the production of automobiles, textile machinery and Diesel engines. It is also endeavoring to keep its hold on the aviation engine, being convinced that within 2 or 3 years there will be such a development in commercial flying as to make this a satisfactory industry.

Air Mail Is Past Experimental Stage

Post Office Department Cuts Rate to 2 Cents as Evidence of Planes' Success

WASHINGTON, July 18—By an order of the Postmaster General to-day fixing the rate of postage on mail carried by airplanes at 2 cents an ounce, the air mail service was placed on a footing with other means of mail transportation.

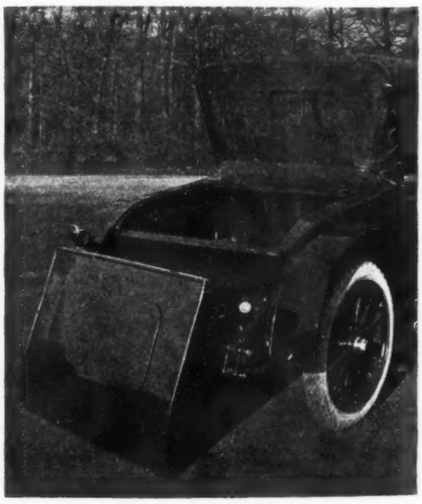
The experiments during the year which have been devoted to the adaptation of the aeroplane to the needs of the regular daily mail service have demonstrated possibilities for increased efficiency for mail transportation beyond the early expectations of the department. More than 10,000 letters a day for Seattle, San Francisco and Los Angeles and other points on the Pacific Coast which fail to connect with the westbound 8.40 p.m. train out of New York are now being advanced 24 hours daily to their points of destination.

In the same way mail from New York that did not catch the 5.15 p.m. train for the West is now being delivered in Chicago the next afternoon instead of the following morning.

Arrangements are now being made to place on the New York-Washington route the three fastest airplanes in the air mail service, each having a capacity of 18,000 letters and a maximum speed in calm weather of 132 miles an hour.

COMPANY TO MAKE MAGNETOS

DAYTON, July 15—The Recording & Computing Machines Co. will commence manufacturing magnetos, combination magneto and generator, self starters and automatic mechanical gear shifts. Production of the magneto will start within the next thirty days. The company has been making munitions.



Essex Roadster showing the novel opening of compartment back of the seat, which permits its use as a light commercial vehicle

$800,000 Sales Reported at Barcelona Show

WASHINGTON, July 18—The automobile exhibit at Barcelona, Spain, netted sales of $800,000 and an attendance of 200,000, according to reports received by the Bureau of Foreign and Domestic Commerce. Exhibits included sixteen chassis, thirty-nine complete cars, eight trucks, one agricultural tractor, two airplanes and numerous accessories. Among the cars shown were: La Hispano-Suiza, Elizalde, Espana, Panhard and Levassor models, Fiat, Renault, Citroen, Nike, Maxwell, Chandler, Simplex-Crane, Buick, Ford, Marmon, Dion Bonto, Chevrolet, Owen, Mercer, Pierce-Arrow, and Pirelli. Accessories included displays of tires, wheels, spark plugs, radiators, etc.

Following the exhibition, the Camara Sindical Espanola de Automovilismo y del Ciclismo de Madrid organized an exposition of passenger cars only, which was held in the Palace Hotel, where eighteen makes were displayed, including Citroen, Delaunay, Elizalde, Hudson, Mercer, National, Peugeot, Renault, Templar, White, Willys-Overland, Stearns, Landa, Winton and Scripps-Booth. The Harley-Davidson motorcycle was also exhibited.

Notable Changes Made in Massachusetts Law

BOSTON, July 19—Four measures of major importance affecting the motor industry and motors have been passed by the present legislature.

One law compels all owners of taxicabs, motor trucks and commercial vehicles to equip their vehicles with mirrors so that it will be possible for drivers to see what is behind. This law becomes effective Sept 3.

Another law relates to theft of motor cars and makes the penalty for stealing not less than five nor more than ten years. Also the prosecuting authorities are tied up through a clause that provides the defendant will have to go to trial. It takes effect Sept. 22.

Next is a change in fees for motor trucks. This was the bill over which the biggest fight was made. The rates have been changed from $5 for one ton and $3 for each additional ton to $10 per ton flat. It was approved a week ago and goes into effect Oct. 7.

A law on the sale of used cars and trucks, effective Sept. 25, provides that no owner of a motor car may sell his or her vehicle to any other person, brother, sister, mother, father, any relative or friend without going to the police and the Highway Commission and getting permission.

The big legislative fight hinged on the fees for the commercial vehicles. The Highway Commission came into the legislature with a report which proposed a radical increase, as for example jumping the fees of a 5-ton vehicle from $17 to $200.

The bill as passed calling for a scale of $10 per ton means doubling the present 1-ton fee, and practically tripling the other tons. However, when one considers the suggestion of a 1200 or 1300 per cent increase of the Highway Commission a drop to 200 and 300 per cent is quite a saving.

S.A.E. Members Hear Tractor Discussion

(*Continued from page* 185)

are not making our tractors good enough to-day. We must make them the best it is possible to make them.

John Fields, editor of the Oklahoma *Farmer*, in telling how long it takes to get a movement working through farming communities, referred to a fifteen-year campaign to get the farmers of Oklahoma to grow kaffir instead of corn. In Oklahoma the climate is too dry for corn. Corn is a good crop not oftener than one year out of five. The last ten crops in Kansas were worth $180,000,000 less than it cost the farmer to plant them, and yet they continued. In the last eighteen years the value of kaffir has been 36 per cent greater than the value of corn, and yet the farmer did not change. If this has been the case with crops a similar difficulty may be met with in tractors.

The quick shift from corn to kaffir was accomplished by working with the bankers. They were shown the increased value of kaffir and soon coerced the farmer into planting it. So it is going to be with the tractor.

FORD SHARES $21,300?

NEW YORK, July 24—Henry Ford and his son, Edsel B. Ford, paid $130,000,000 for 6100 minority shares of the Ford Motor Co., according to statements in financial quarters here. This is at the rate of $21,300 a share, which would place the market value of the entire Ford stock at $426,000,000. To finance their purchase the Fords negotiated a loan of $75,000,000 through New York and Boston banking houses.

AIR SERVICE IS SAVED

WASHINGTON, July 23—Abandonment of the Army Air Service is to be avoided by assigning to the aviation corps officers appointed to other arms of the service. This plan of procedure was suggested by Representative Anthony and pronounced a good solution of existing difficulties by Secretary Baker in his testimony at the Military Affairs Committee hearing yesterday.

NEW WESTERN SPEEDWAYS

NEW YORK, July 23—The A. A. A. Contest Board has been advised unofficially that Clifford Durant, the manufacturer-racer, has perfected plans for two 2¼ mile plank speedways on the Pacific Coast—at San Francisco and Los Angeles. The tracks, it is said, will cost $125,000, and Durant expects to co-operate with the Tacoma racing officials in the matter of dates and purses.

Swede Studying Tractors in U. S.

Bergstrom, Here to Buy Machinery, Describes German Testing Plan

NEW YORK, July 24—With the object of studying the American tractor industry and buying American machine tools for his firm, Gunnar Bergstrom of Eskilstima, Sweden, has been visiting the industrial centers of this country for the past two months. He will return shortly to his native land.

Referring to the tractor trials at Wichita, Bergstrom could not see that they would materially advance knowledge of mechanical cultivation. He recommended the adoption of a plan which was in vogue in Germany before the war.

Under that system an institution for testing all kinds of farm machinery, including tractors, was operated by the government. To this testing laboratory could be sent any farm machine which any manufacturer or importer desired tested. The results of the tests were then published in a monthly bulletin, which was sold at a subscription rate. Copies of this bullentin for ten years back were filed by Bergstrom.

Without some adequate test, states Bergstrom, farmers cannot have sufficient knowledge of what they are buying, and the tractor business will be held back.

Bergstrom represents the Munktells Mekaniska Verstads Aktiebolag, or Munktells Machine Shop Company. The concern made about 500 tractors last year and plans to increase its production greatly.

The tractor is of the heavier type and burns crude oil in a hot, bulb type of engine which weighs about 1500 lb. It is rated at 40 hp.

During the war motor fuel could be obtained only upon the presentation of a certificate showing that it was intended for use in agricultural work. Crude oil cost about $1 a gallon and gasoline $1.50. Bergstrom thinks that the future belongs to the crude oil burning tractor, as the supply of gasoline is likely to shortly prove insufficient to meet the demands for automobiles.

Swedish tractor manufacturers hope to find a receptive market in Russia when that country settles down to a peaceful condition again. At present Sweden is not trading with Soviet Russia.

SELL A. E. F. SURPLUS

WASHINGTON, July 22—C. W. Hare, director of sales of the War Department, accompanied by a large staff of experts, has gone abroad to dispose of the surplus stocks of war materials held there. More than $1,500,000,000 worth of surplus property is to be disposed of.

Clifton Re-elected Head of the National Chamber

NEW YORK, July 17—The National Automobile Chamber of Commerce announced to-day that Charles Clifton, president, and other officers were re-elected at the directors' meeting in Buffalo yesterday.

Aside from Mr. Clifton, who is with the Pierce-Arrow organization, the officers are: First vice-president, Hugh Chalmers, Chalmers Motor Co.; second vice-president (passenger car division). R. D. Chapin, Hudson Motor Car Co.: second vice-president (motor truck division), Windsor T. White, White Motor Co.; secretary, C. C. Hanch, Maxwell Motor Co.; treasurer, H. H. Rice, Chevrolet Motor Co.

The Cleveland Automobile Co., Cleveland, Ohio, and the Holmes Automobile Co., Canton, Ohio, were elected to membership.

B. L. Combs has been placed in charge of the experimental laboratory of the Oakes Co., Indianapolis, manufacturer of radiator cooling fans for tractors, trucks and passenger cars. Combs comes to the Oakes Co. after nearly two years' service as an officer in the Signal Corps, A. E. F., and for two years previous to entering the army was assistant instructor in physics at the University of Wisconsin.

F. George Walker is in charge of the newly opened New York office of Fuller & Sons Mfg. Co., automobile parts builders.

J. Murray Page, until recently manager of the Chicago branch of the Locomobile Co. of America, has been appointed western district sales manager of the company. He will continue to make his headquarters in Chicago. C. B. Amorous, formerly director of Locomobile sales, succeeds Mr. Page as manager of the Chicago branch.

B. F. Kelly has assumed charge of the sale or Weidely Bulldog motors. Kelly for a number of years was district sales representative for the National Acme Co. and more recently became a partner in the Bernard E. Griffey Motor Supply Co., Indianapolis, in which firm he retains an interest. The Weidely Motors Co. product is sold largely to the tractor trade.

Lucius French, advertising manager of the National Motor Car & Vehicle Corp., has resigned to become secretary of the Western Oil Refining Co., Indianapolis. Mr. French was the first advertising manager of the Cole Motor Car Co. ten years ago and held a similar position for the past five years with the National company.

Charles G. Guild has been named successor to Clayton O. Griffin as secretary and service manager of the Wayne Oil Tank & Pump Co. Guild comes from the Burlington Wheel Co., Burlington, Iowa, where he was manager.

Men of the Industry

Changes in Personnel and Position

Mark Havenhill has been appointed regional agricultural director for the southwestern territory, with headquarters at Oklahoma City, for the Cleveland Tractor Co. He was formerly professor of farm engineering at the University of Kentucky and is a graduate of, and formerly instructor at, the University of Iowa at Ames. He will assist in adapting the Cletrac to the farm conditions in the territories which they cover.

Col. Fred Glover has been made assistant general manager of the Timken-Detroit Axle Co. He was formerly vice-president of the Emerson-Brantingham Co. of Minneapolis. During the war he was chief of the motors division of the War Department.

Wallace C. Hood has been appointed general sales manager of the Standard Motor Truck Co., Detroit. Hood held this same position with the Standard company four years ago. More recently he was sales manager of the King Motor Car Co.

W. J. Munro, assistant advertising manager of the General Motors Truck Co., has resigned to return to his position with the Green-Fulton-Cunningham Co., which handles the advertising of the G. M. C. truck.

George H. Miller, superintendent of the milling division of the Reo Motor Car Co., has resigned and goes with the Holt Manufacturing Co., Peoria, Ill., as general superintendent. Miller joined the Reo organization in 1910.

R. M. Stetson, formerly with the Packard and Maxwell companies as Detroit representative, has been appointed Detroit representative of the Xardell Brothers Co., Utica, N. Y., builder of gasoline tanks for automobiles.

George D. Bailey, formerly with the Brown-Lipe Gear Co., Syracuse, N. Y., has been appointed sales manager of the Hinkley Motors Corp. He will take up his new duties Aug. 1.

Ralph D. Webster, general sales manager of the Wire Wheel Corp., Buffalo, has resigned and has joined the forces of the Fred E. Castle Co., distributer for the United States of the Hayes Wheel Co.

Fred W. Jones, formerly with the advertising department of the International Harvester Co., has been made advertising manager for the Holt Mfg. Co., Peoria.

NOBLE TRUCK ELECTS

KENDALLVILLE, IND., July 18—Four men formerly with the Gary Truck Co. have been elected officers of the Noble Motor Truck Corp. L. W. Nichols, former Gary secretary, will be general manager; C. W. Cole, general sales manager for the Gary company, will hold a similar position with the Noble company; J. W. Baird, sales manager of the central states, will fill a similar position, and E. M. Sharp, former Gary production manager, will fill that position for the Noble company.

MASON TIRE IN MILWAUKEE

KENT, OHIO, July 21—The Mason Tire & Rubber Co. has opened a branch at 450 Jackson Street, Milwaukee. E. E. Gessert, formerly with the Racine Auto Tire Co., has been appointed branch manager.

WALDEN BRANCH MOVES

SAN FRANCISCO, July 19—The Western branch office of Walden-Worcester, Inc., has moved to larger quarters at 487-91 Monadnock Building. The branch manager is L. A. Raasch, with whom is associated R. K. Flanagan.

ONE MAXWELL TRUCK NOW

DETROIT, July 21—Only one model of truck now is being sold by the Maxwell Motor Sales Corp. It is the 1½-ton size and is listed at $1,185. It supersedes all previous sizes.

McMULLEN EXPANDS

GRAND RAPIDS, MICH., July 22—The McMullen Machinery Co. has increased its capital from $30,000 to $75,000. Of the stock $25,000 is 8 per cent preferred, redeemable in 1929.

AVERY PRICES REDUCED

HUTCHINSON, KAN., July 24—Avery dealers in this territory were notified to-day of a reduction of the Avery model 12-25 from $1,270 to $1,000 and the 8-16 from $925 to $700.

R. C. Duffus will be in charge of a sub-branch of the Detroit branch of the Packard Motor Car Co. in Kalamazoo, for Kalamazoo and Calhoun counties. A building will be erected at 523-527 West Main Street.

Earl W. McGookin has resigned as vice-president of the M. V. Kelly Co., advertising agent of New York and Toledo, and will go to Detroit, Aug. 1, to represent the Macbeth-Evans Glass Co., manufacturer of lenses.

E. A. White has resigned as head of the division of agricultural engineering at the University of Illinois to become research engineer for the Holt Manufacturing Co., Peoria.

H. G. Jackson, formerly Detroit representative of the Wire Wheel Corp. of America, will succeed Ralph D. Webster as general sales manager.

TIMKEN BUILDS IN OHIO

COLUMBUS, OHIO, July 19—The work of erecting the local branch of the Timken Roller Bearing Co. will start soon. The company recently secured title to a 9-acre site at the corner of Fifth and Cleveland Avenues on which the Columbus branch will be constructed. About $1,500,000 will be spent in buildings and equipment. Care will be taken to provide light for the workers. Construction will be of the sawtooth type.

BLACK HAWK CO. BUILDS

DES MOINES, IOWA, July 19—The Black Hawk Tire Co. has started construction work on the first unit of its factory for the manufacture of tires and tubes. The plant is located on trackage at East Twentieth and Walnut Streets. The first unit is to be two stories and basement, 320 by 640 ft. It will cost $150,000.

TRACTOR CO. BUYS SITE

DES MOINES, IOWA, July 19—The Peoria Tractor Co., which recently was re-incorporated in Iowa, with a number of Des Moines capitalists as stockholders, has just purchased a site for the new factory to be built here.

ENGINE COMPANY GROWS

EAST MOLINE, ILL., July 21—Increased capitalization and enlarged plant space have been announced here by the Root & Van Dervoort Engineering Co., manufacturer of automobile and tractor engines. The stock has been increased from $1,346,200 to $7,500,000 and the purchase of 61 acres of land, adjoining the present plant, for the erection of new buildings, has been completed.

NEW RUBBER CO. OPENS

MANSFIELD, OHIO, July 18—Construction has been begun here on the new buildings for the Perfect Rubber Co. and it is expected the work will be completed by Aug. 15. John H. Link, formerly chief chemist for the Faultless Rubber Co., of Ashland, will be associated with the new concern here.

RUBBER CO. BUILDS TOWN

PHILADELPHIA, July 19—The Pennsylvania Rubber Co. is building a model town for its employees on a tract of 120 acres immediately south of its plant. A minimum of 600 dwellings will be built. There will be an athletic park, community center and a schoolhouse.

NEW PLANT FOR VAN BRIGGLE

INDIANAPOLIS, July 18—Plans for a plant to cost $100,000 are being drawn for the Van Briggle Motor Device Co. The new structure will be 108 by 208 ft., and will be located at 429 North Capitol Street.

MILBURN ADDS SPACE

TOLEDO, July 18—The Milburn Wagon Co. has added 40,000 sq. ft. of floor space to its present factories.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

TRACTOR CO. MOVES

TOLEDO, OHIO, July 21—The Automotive Corp., farm tractor manufacturer, has moved its general offices here from Fort Wayne, Ind. Plans in consideration call for erection of a factory group in Toledo. The present manufacturing plant is at Napoleon, Ohio.

REPUBLIC OPENS IN CANADA

LONDON, ONT., July 21—A branch factory for the Republic Motor Co., of Alma, Mich., will be located here, according to announcement by A. C. Smith, of Toronto, who will be the general manager. A structure to cost $500,000 will be erected.

TRIANGLE CO. ENLARGES

ST. JOHNS, MICH., July 19—The capital stock of the Triangle Motor Truck Co. has been increased from $100,000 to $200,000. An enlargement of the company's factory here has been reported.

STEWART ENLARGES

BUFFALO, July 22—The new plant of the Stewart Motor Corp. will be ready for occupancy Sept. 1, making possible a yearly production of 10,000 Stewart trucks. The new factory property covers approximately nine acres.

NEW TRACTOR AT DALLAS

DALLAS, TEX., July 21—Offices have been opened here by the Standard Farm Tractor Co., the organization of which has just been announced. The company expects to erect here a plant with a capacity for making 1000 tractors a year.

BULL CO. TO INDIANA

ANDERSON, IND., July 19—General offices of the Bull Tractor Co. have been moved to this city from Minneapolis and have become a part of the Bull Tractor Madison Corp.

CLOVER ADDS BUILDINGS

NORWALK, CONN., July 21—The Clover Manufacturing Co. will have erected a 90 x 220 ft. building, another structure 35 x 60, and two stories and basement 21 x 52, at a cost of $90,600.

OWEN TIRE TO ADD

CLEVELAND, July 19—The Owen Tire & Rubber Co. is planning to increase its factory capacity in order to catch up on orders.

U. S. Light Doubling Capacity of Its Plant

NIAGARA FALLS, N. Y., July 21—Erection of new buildings and additions to present structures are now under way at the plant of the U. S. Light & Heat Corp.

The expansion will more than double production, and the various departments will be rearranged to increase efficiency.

New machinery to be installed includes double the number, together with improved types, of oxide mixing and plate pasting apparatus, and new moulding machines, minimizing the hazard to workmen handling molten metal.

GENERAL MOTORS AT ST. LOUIS

NEW YORK, July 18—A new plant costing $5,000,000 will be erected for the General Motors Corp. at St. Louis, it was announced here to-day. A site, valued at $750,000, has been purchased and the erection of buildings costing $2,500,000 will be under way at once. The production of Buick and Chevrolet cars there will require machinery costing about $1,500,000. The building plans, it was said, provide for the construction of additional units to double the capacity of the plant within the next twelve months.

NEW TRACTOR PLANT

ANDERSON, IND., July 21—The Star Tractor Co., Findlay, Ohio, and the Indiana Silo Co., of this city, have been merged under the name of the Indiana Tractor & Silo Co., with $1,500,000 capitalization. It is proposed to erect here a plant capable of producing 5000 tractors a year.

DETROIT RADIATOR ADDS

DETROIT, July 18—The Detroit Radiator Corp. has bought a factory site on the Grand Trunk Railway and will build a new plant at once. Harry H. Rowe, for 14 years branch manager for the Burroughs Adding Machine Co., has been appointed general manager of the company.

BENJAMIN MOORE BUILDS

CLEVELAND, July 21—Benjamin Moore & Co., paint and varnish manufacturing concern, will construct a plant on a 4-acre site, which will double the company's output. The plant will consist of six units, totaling $200,000 in cost. The first unit is to be a 3-story office building.

STORM CO. MOVES

MINNEAPOLIS, MINN., July 18—The Storm Mfg. Co. has moved to this city from Thompson, Iowa, the new company address being 406 Sixth Avenue, here. The change in location becomes effective Aug. 1.

ANDRIX LOCK-NUT LOCATES

ADRIAN, MICH., July 19—The Andrix Lock-Nut Co. has purchased the Austin & Rose planing mill property. Lock nuts and automobile specialties will be manufactured.

Speedier Engine Marks New Reo

Company to Put Out Single Model in 1920—Maibohm Announces Improvement

LANSING, MICH., July 21 (*Staff Correspondence*)—One model, incorporating a new 6-cylinder engine and a chassis representing a development of the present four-cylinder type will be marketed by Reo for 1920. The new power plant includes all of the features which have become characteristic of Reo practice, but is refined throughout. It is a higher speed type, peaking at 2750 r.p.m. instead of 1800 to 2000, as with previous Reo engines.

Mounted on the 120 in. wheelbase will be a five-passenger touring and a three-passenger roadster body, selling for $1,650. A line of closed bodies will be introduced later. The principal refinements in the engine, which is a 3 3/16 by 5 in. unit, consist of block casting the six cylinders, the use of a detachable head with a removable cover plate, and a 2¼-in. crankshaft carried on four bearings. The overhead intake and side exhaust valves are still employed. Preheating arrangements for the air are now used with a short portion of the intake header and the exhaust manifold integral.

The dry-disk clutch is continued. The car has Hotchkiss drive, with semi-floating axle and semi-elliptic springs. The chassis parts and running gear generally are unaltered or refined in minor detail. A noteworthy change is the abandonment of grease cups in favor of the high pressure grease gun system, by means of which grease is forced under 500 lb. pressure to the bearing points through fittings adapted to the gun tube.

A feature of the equipment is the use of 33 by 4 in. cord tires all around as standard. The car is upholstered with hand buffed leather over Marshall springs. The body and hood are blue and the wheels white.

DETROIT, MICH., July 19—Greater comfort and increased strength, as well as new body designs, feature the new models of the Maibohm line, the announcement of which has just been made by the Maibohm Motors Co. The coming model has a phaeton body with slightly lower cowl and a pronounced bevel line extending the entire length of the car, giving a smarter and more handsome appearance. The frame and springs are increased in strength for more comfortable riding. The frame has been increased to a 7-in. section tapered front and rear, with cross bracing to take up side strain, while the rear springs have been enlarged to a length of 52 in.

In line with the principle of easier riding and more comfortable qualities, a more flexible and deeper seat cushion and back springs have been added. Motor and mechanical equipment remain unchanged.

A price increase of $105 also was announced, the new figures being:

Chassis	$1,260
Phaeton	1,395
Sedan	1,995
Roadster	1,395
Brougham	1,995

Pleasure Cars Rare Luxuries in Italy

(*Continued from page* 186)

handled on industrial railways of the Decauville type. Four-fifths of the machine tools are made in the United States, all the leading makes being represented.

"There are 1000 men employed, making marine and aviation motors, camions and pleasure cars. The shop is well arranged and the cars turned out are of the first quality, being considered one of the first makes of Italy.

"The plant of Eduardo Bianchi in Milan is well known in Italy, but its cars have not been sold in the American market as much as those of other makers, probably on account of the difficulty of selling a low priced car of foreign make in competition with American low priced cars. The company has been making motorcycles, bicycles and airplane motors during the war and the plant is still working on government contracts for airplane motors. Orders for pleasure cars are far in excess of the capacity, which is fifteen a day. The output of motorcycles is 5000 per year and bicycles 60,000 per year.

"The factory buildings are of concrete, of two kinds, one story saw tooth roof for all the motor car work and four story concrete construction for the motorcycles and bicycles. The four story buildings are of modern construction, with stairways on the outside. Two thousand workmen are employed and the tools are largely American made. The jigs and fixtures are the best designed and constructed of any which were seen in Italy. Milling machine operations were especially good, the methods employed being like those used in American shops. The Bianchi car is one of the lowest priced Italian cars, selling at the present time for 20,000 to 24,000 lire, whereas before the war the price was about 6000 lire.

"The Fiat Co. of Turin is the largest and best known automobile concern in Italy, its capital being 25,500,000 lire. It employs 29,000 hands in the shops in Turin, the central plant having 16,000 of these. In 1914 they made 4800 cars. During the war the output was seventy-five camions per day and forty airplane engines. The total output of motors during the war was: 6-cylinder motors, 1080 of 110 hp., 7000 of 260 hp., 7500 of 300 hp.; 500 12-cylinder motors of 700 hp. each. There are several plants in Turin widely separated, one making forgings, another carbureters, rear axles and steering parts, another making bodies and a fourth where the remaining parts are made and machined and the cars assembled.

"There are about 3000 machine tools in the last plant, fully one-half of which were made by the Fiat Co. during the war because of inability to get them elsewhere. There are nearly 300 American grinding machines in this plant, which shows the importance placed on grinding.

"The Lancia factory, also in Turin, is a very well arranged modern plant and the methods of manufacture are modeled after those used in America. The buildings are all of one story, with saw tooth roofs, and are well lighted through skylights. There is plenty of room between machines, but there is the lack of facilities for handling parts which is noticeable in so many Italian factories. Many of the supplies for cars, such as axles, steel, lamps and brake linings, are imported from America. Most of the machine tools are American and more are being imported as the company finds them better suited to their needs than those of other countries. The shop is electrically driven by current from the city supply coming in at 3000 volts and distributed by transformer at 500 volts for the motors. The lighting is at 120 volts direct current.

"There are a foundry for cast iron and aluminum, storage rooms for spare parts, and a garage and repair shop. There is also a body shop which at present makes only camion bodies but will make bodies for pleasure cars in the near future. There is a good gage inspection system and the gages are kept to the prescribed limits. All motors are tested on Froude water brakes and all complete cars are tested on the road. The camions are very well made, are liked by all chauffeurs and carry 1500 kilos load. The price at present is 32,000 lire.

"The Lancia cars are considered the best in Italy.

"In all these automobile plants the output is small compared with that of the same size plant in America, the difference being due to the lack of system and poor design of jigs and fixtures. In some cases the speed of the machine tools is too low, which greatly reduces the output and does not save the tools. Too many machines perform but one operation for a single set up of the part, and too many jigs are used on a part. This requires the part to be handled many times and much movement from one machine to another. Multi-operation machines are scarce as well as multi-operation jigs.

"Until these things are remedied and raw material becomes cheaper it will be very difficult for Italy to become a world market factor in the low priced pleasure car manufacture."

Kelly-Springfield Capital $20,000,000

TRENTON, N. J., July 17—To finance construction of its new plant at Cumberland, Md., the Kelly-Springfield Tire Co., a New Jersey corporation, to-day filed a certificate with the Secretary of State increasing its capital stock from $13,900,300 to $20,900,300. The new plant, it was stated, will cost approximately $5,800,000.

Car Makers Need So. African Agents

Distributer Says American Firms Are Handicapped Without Direct Representatives

NEW YORK, July 21—Until American makers of automotive apparatus secure representation in the Union of South Africa by direct manufacturers' representatives they will be carrying on their export trade under a continuous handicap. This is the conclusion reached by William Campbell of Johannesburg and Cape Town, who is making his annual visit to America, and who handles a line of a dozen or more American products, and distributes them over the entire Union of South Africa.

Campbell says that previous to the war practically 100 per cent of the British distribution of manufactured goods and an increasing proportion of automobiles and trucks in the Union of South Africa was accomplished through manufacturers' agents, but that to-day Americans are doing very little business through such channels. Through the manufacturers' agent an American concern, according to Campbell, gets practically the same representation that the manufacturer would secure if he established his own branch in Johannesburg or Cape Town.

Opens Service Stations

Campbell is a believer in this policy and has established twenty-eight service stations for the Prest-O-Lite battery in his territory. Eight of these are chief places where everything connected with rebuilding batteries can be done, and twenty are sub-stations largely to be used for charging. Campbell is prepared to give similar service in connection with other products that he is handling.

One of the handicaps which the American manufacturer works under when not dealing direct through manufacturers' agents, mentioned by Campbell, is that of increased cost in transportation, insurance, etc. There are cases where shipping space has been taken at one rate and charged at a considerably higher rate to the distributer. Unless the South African distributer is in direct contact with the factory there is not that point of contact between the manufacturer in America and the consumer in South Africa that is necessary for good business.

Country Is Wealthy

Speaking of general conditions, Campbell says that South Africa was never so wealthy and there was never so much floating money. This has been due to the high prices of farm products during the war, and should the two new diamond fields, which are believed to have been discovered, prove successful, they will exert a big influence on general financial conditions. The iron and steel industry is just being started in South Africa.

There was a considerable shortage of automobiles due to shortage of shipping facilities, but recently this has been corrected. Farmers are purchasing 50 per cent of the automobiles sold, and these are mostly of the five-passenger touring car type, which is the standard of the country. The demand for magneto equipment, in addition to electric starting and lighting, continues general, and the companies fitting the magneto are correspondingly establishing themselves in the market.

The South African farmer wants practically the same type of car as the American farmer and the road conditions are about parallel. There is a bigger demand for the higher priced car than there was previous to the war. Gasoline consumption is still an important factor in car operation. Previous to the signing of the armistice the price was $1.20 per imperial gallon, and now it is approximately $1. There is generally sufficient gasoline in the country, with occasional shortages due to delay in ocean transportation. Kerosene lists at 60 cents per gallon.

While the sale of medium and heavy capacity trucks is rather slow, there is a good demand for light trucks, such as Maxwell, Dodge, Ford, etc. The demand for farm tractors is rather slow, due to the fact that American farm tractors which reached South Africa five or six years ago made a very poor showing and many in South Africa still compare the present tractor with that of six years ago. The tractor that will sell best in South Africa is one that can be retailed at approximately $1,500.

CHAMPION IN EUROPE

FLINT, July 18—Albert Champion, president of the Champion Ignition Co. of Flint, will sail Aug. 16 to arrange for the location in France and also in England of factories which will manufacture the A. C. and other models of spark-plugs and speedometers.

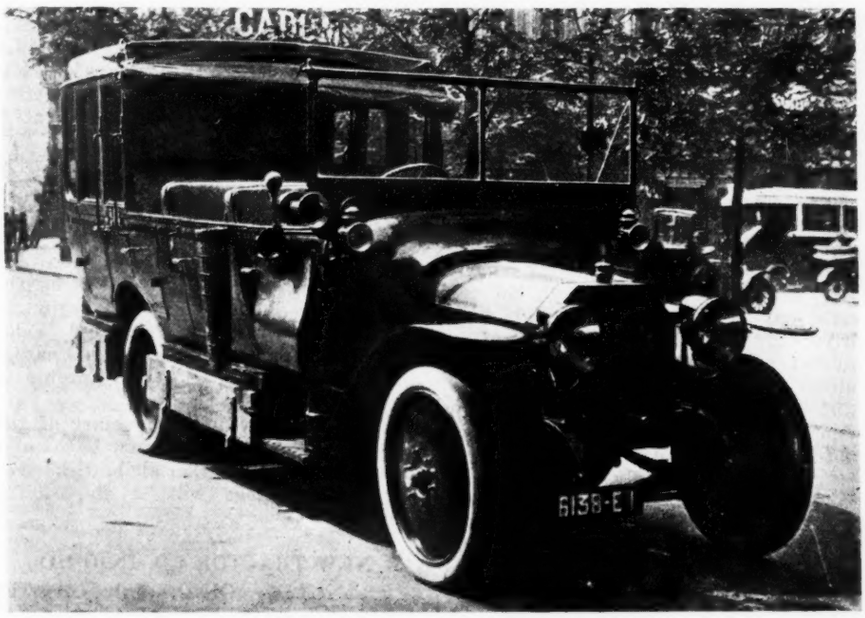
Seek Light Tank For Alpine Use

France Offers Competition for Commercial Vehicle Adapted to Mountains

PARIS, June 28 (*Staff Correspondence*)—A light-weight commercial tank for use in the Alps, where neither road nor track railroads exist, is the latest requirement in France. The task of discovering the best type of vehicle for doing this class of work, which up to the present has been very imperfectly accomplished by means of mules, has been entrusted to the technical committee of the Automobile Club of France. A public competition will be held, the details of which will be decided by the sub-committee, of which Georges Lumet Prince Pierre d'Arenberg, Lieut.-Col. Ferrus, and L. Perissé are the members. This is the first active public work undertaken by the technical commission of the club since 1914.

Considerable experience has been gained during the war with 4-wheel drive tractors and self track-laying machines. These have been made use of notably for the haulage of guns or for putting guns into position over various kinds of land. The problem in the mountains is somewhat special, for, whereas tanks and 4-wheel drive tractors generally worked on soft ground, the Alpine tanks will have to travel over rocky surfaces and at the same time climb very considerable gradients. These vehicles are required not only for the transportation of goods but also for the carriage of passengers.

The competition will be of a practical nature, doubtless with awards based on economy for the transportation of goods and passengers under certain conditions.



One of the many automobiles which make round trips over the scenes of the recent fighting now that touring over the battlefields of France is permitted. The journey takes one week and costs $160, including hotels

U. S. Manufacturers Enter Grand Prix?

Cars May Be Produced for Paris and Indianapolis Under New Rules

NEW YORK, July 19—Contest officials of the American Automobile Association and racing men here declare that reports from manufacturing centers indicate consideration by several leading producers of the question of designing cars to enter in the French Grand Prix next year.

In view of the fact that the Indianapolis Speedway authorities have changed the specifications for entrants in the 1920 sweepstakes, establishing 183 cu. in. as the standard piston displacement—equivalent to the French 3 liter ruling—it is said that the factory heads have been encouraged to go ahead with plans for new creations, which could serve the double purpose of appearing on the track in this country and abroad.

Indianapolis an Encouragement

The new Indianapolis specifications, bringing lighter cars and smaller engines to the fore, are expected to prevail as well on most of the lesser American tracks next year, though it is probable that a few contests will be held of racing cars now in the field and good for another season's work.

Except for a few two and three car races to be held this month and next, only one day's racing remains on the Sheepshead Bay program this year. The card, which may bring about a revival of the Astor Cup competition and offer a 200 or 250-mile event, is scheduled for Sept. 13, the original date having been advanced one week. It is expected that the Chevrolets, De Palma, Wilcox and a score or more of the country's leading drivers will appear at this meet.

Indianapolis Specifications

INDIANAPOLIS, July 19—After consultation with automobile engineers and manufacturers patronizing speedway races, the Indianapolis Motor Speedway management has adopted the following detailed specifications for next year's race: Piston displacement, 183 cu. in.; minimum weight, 1700 lb., with no ballast allowed; standard tread, 56 in.; seats may be staggered 8 in.; right hand drive; qualifying speed, average of 80 miles per hr. for 4 laps of the track, 10 miles.

These specifications, though few in number, are nevertheless all-embracing and will direct the activity of racing car designers into entirely new channels. The problem now is to produce a car with greater specific engine output, which at the same time is a roadworthy vehicle in every sense. The minimum weight restriction of 1700 lb. and the provision for a standard tread will insure, it is believed, a type of vehicle which may serve as a model in passenger car designs.

The regulation permitting the staggering of the seats is to give the driver more room, at the same time permitting the body to be made as narrow as possible to reduce wind resistance. Also, with the mechanic placed farther back, he can observe three of the four tires, the two in the rear and the left front. Right hand drive is specified, inasmuch as on speedways cars always pass to the right, and left hand drive would therefore be dangerous. It is stated that converted light cars now in existence will be effectively barred from the 1920 race by the regulations governing speed and minimum weight.

Wright Martin-Internationl Merger Plans Outlined

NEW YORK, July 22—The New Brunswick, N. J., plant facilities of the Wright-Martin Aircraft Corp., together with $5,000,000 to $6,000,000 of its cash, will be put to profitable use as a result of the merger of the company with the International Motor Truck Corp., recently approved. According to President Houston of the International the additional resources should in the course of the next three or four years permit of an increase in the production of Mack trucks from the present figure of around 4000 to approximately 12,000 per year. Attention was called, however, to the fact that earnings of International Motor Truck Corp. subsidiaries for the first five months of 1919 were $1,394,663, and it is expected that earnings for the calendar year 1919 will be about $3,500,000 before deduction for taxes, against preferred dividend requirements on the total of the proposed outstanding issues of first and second preferred stock of approximately $1,155,000. It is therefore confidently expected that dividends on both preferred issues can be paid as they fall due.

The Wright patents, the remaining Simplex business, and the Hispano-Suiza license agreement will be transferred to the aeronautical corporation, together with any new business for airplane motors which may develop.

Unfilled orders for Mack trucks on June 1 stood at over $3,000,000.

U. S.-CANADA AIR RACE

NEW YORK, July 23—Canada and the United States will be linked by the aerial route during the week beginning August 25, when the Prince of Wales will start a number of Canadian aviators in airplanes on the trip from Toronto to New York.

Simultaneously with the start of the Canadians, Americans who have also been victorious in aerial battles over the German lines will be started for Toronto.

NEW TRACTOR CO. IN OHIO

FRANKLIN, OHIO, July 21—The Franklin Tractor Co. has been chartered with a capital of $300,000 by George Hills, Gay Bevis, J. S. Van Horn, Robert A. Quigley and Clifton W. Unglesby.

Applications Heavy For the Paris Show

Temporary Building Necessary to House Part of First After-War Exhibition

PARIS, July 5 (*Staff Correspondence*)—Applications for space at the Paris show, to be open on Oct. 9, are coming in at such a rapid rate that it has been practically decided to erect a temporary building near the Grand Palais to be used for trucks and stationary engines. This will leave the Grand Palais free for passenger cars, bodies, accessories, etc.

The last day for receiving applications for space, with a guarantee that allotments will be made, was July 10. After this date, applications can be made, but there is no guarantee that space will be found.

This being the first European show to be held since the war, it has been decided to reserve a large amount of space to an exhibition of all kinds of motor vehicles having been used in the war. This will comprise tanks, armored cars, searchlight cars, balloon winches, special automobile type gun carriages, ambulances, etc.

For more than four years the Grand Palais has been made use of for military purposes, first as an automobile depot, later for quartering troops, as a hospital, and as a physical instruction center. It has been rather seriously damaged by reason of these occupations and by shell splinters from anti-aircraft guns. Large number of workmen are now putting it into condition, the cost of repairs being estimated at $400,000.

The Paris Salon is the first of the series of European shows. It will be followed by exhibitions in London and Brussels.

American firms on the first list of exhibitors are: Buick, Cadillac, S. F. Bowser and Klaxon.

Air Service Curtailed

WASHINGTON, July 21—Plans for the establishment of four observation air squadrons in the Philippines as part of the basic defense of the islands will have to be abandoned, army officials say unless some remedy is found for the present situation of the Air Service Each of these squadrons requires forty-one flying officers and the entire commissioned personnel of the service will number only 222 by September 30.

Other important projects to be abandoned include three squadrons for Hawaii, three squadrons for Panama and two for the border patrol, and forty balloon companies for the United States.

HARTFORD TO BUILD

HARTFORD, CONN., July 19—The Hartford Rubber Co. will enlarge its plant so as to increase the working force from 2000 to 6000 men.

Tests of Gasoline In War Disclosed

Bureau of Mines Tells of Work in Altitude Chamber—Cyclohexane Proves Worth

WASHINGTON, July 21 (*Staff Correspondence*)—That gasoline had to be tested and graded according to specifications before it met the military requirements during the war has just been told by the Bureau of Mines in a summary of its war work.

Specifications for three grades of airplane gasoline were adopted on May 30, 1918, following numerous tests at Langley Field, where it was found that "plain motor" gasoline gave as good results as a "high test" Pennsylvania product, but tended to overheat the engines, following which Liberty engines set up in the Bureau of Standards' altitude chamber were used, and proved that a mixture of 70 per cent cyclohexane and 30 per cent benzol (so-called "hecter") seemed the most desirable for use in fighting airplanes. This fuel permitted the use of engines having compression ratios as high as 7.5 to 1, which, applied on the Liberty engine, would develop perhaps 10 per cent more power.

New Fuel Gave Altitude

Hostilities ceased in time to prevent the development of a commercial cyclohexane plane, but flying tests at the Wilbur Wright Field made since the signing of the armistice showed that the use of a high-compression engine with cyclohexane as fuel gave the standard De Haviland-4 airplane fully 1000 ft. extra "ceiling."

In addition the Bureau of Mines collaborated with the War and Navy departments making inspections of overseas shipments of gasoline, improving the recovery of gasoline from natural oils, collecting data on the refinery industry and testing oil mixtures.

Altitude Chamber Built

It was realized soon after this country entered the war that ordinary motor gasoline was not suitable for use in airplanes, particularly at high altitudes. The Bureau of Standards, therefore, constructed its altitude chamber for testing airplane engines under conditions similar to those encountered at various altitudes from sea level to 30,000 ft. Different types of fuels were tested to determine which were most satisfactory at high altitudes. The bureau co-operated by collecting samples of various grades of gasoline, special fuel mixtures and close-cut gasoline. In April and May, 1918, arrangements were made with the Atlantic Refining Co. and the Union Oil Co. of California to make special close-cut gasoline with a boiling range of 10 deg. C. if possible. A special fuel was made from absolute alcohol and gasoline, the absolute alcohol and a blend of gasoline and benzol being prepared in the Washington laboratory of the Bureau of Mines. All the fuels, about 100 samples, tested by the Bureau of Standards in airplane engines were submitted to distillation tests in that laboratory.

In some airplane engine tests at the McCook Field aluminum pistons were seriously corroded. Investigation showed that the corrosion was not caused by impurities in the fuel and could be controlled by lubrication.

Two samples of German airplane gasoline, analyzed at the Pittsburgh laboratory of the bureau by H. H. Hill, proved to be petroleum gasoline carefully refined.

Samples of gasoline from Borneo and from Sumatra were found to be suited for aviation fuel.

Trucks and Trailers Limited by New Laws

NEW YORK, July 18—New size, weight and speed limitations, as well as increased registration fees, for trucks and trailers have been adopted by several states. An announcement of these changes were made here to-day by the Trailers Manufacturers' Association. A compendium was prepared showing the new laws that have just become effective in the states of Pennsylvania, Wisconsin, Indiana, Illinois, North Carolina and Iowa. This shows that Pennsylvania registration fees for a 7-ton truck would be as high as $150. The report follows:

Pennsylvania, 26,000 pounds gross weight of vehicle and load.

Wisconsin, 24,000 pounds gross, 18,000 pounds on one axle, and 800 pounds per inch width of tire.

Indiana, 10 tons gross.

Illinois, 16,000 pounds on one axle and 800 pounds per inch width of tire.

North Carolina, 5½ tons load capacity.

Iowa, 14 tons gross, 4 tons on any wheel and 800 pounds per inch width of tire.

Dimensions of trucks (which include trucks with semi-trailers) and length of trailer trains are fixed as follows:

Pennsylvania, length of a single vehicle 28 feet, width 90 inches.

Wisconsin, length of vehicle 30 feet, width 96 inches, length of trailer train 100 feet between 8 p. m. and 5 a. m.

Illinois, length of train, 65 feet.

There is a wide variation in registration fees for trucks and trailers. As fixed in new laws they range thus:

Pennsylvania, $15 for a truck of two tons capacity to $150 for a seven-ton truck, and $2 for a trailer weighing 500 pounds to $15 for one weighing more than 2000 pounds.

Indiana, trucks weighing less than 500 pounds are exempt; $6 for trucks of ¼ ton capacity to $50 for 7½ tons or more; trailer fees one-half of truck fees.

Illinois, $15 for truck or trailer weighing 7000 pounds with load to $60 for more than 15,000 pounds gross weight.

North Carolina, $12 for truck of one-ton capacity or less to $100 for 5½ tons capacity; trailers, $10 for first ton of capacity and $20 for each additional ton.

Iowa, $15 for trucks of one-ton capacity or less to $175 for solid-tired trucks of six tons capacity; trailers $10 for one-ton capacity to $70 for solid-tired six-ton trailer. Rubber-tired trailers under 1000 pounds capacity used with passenger automobiles for personal baggage or effects are exempt.

New British Ford Head Aids Dealers

Anderson Reported Righting Retailers' Wrongs in Americanization of Service

LONDON, July 8 (*Staff Correspondence*)—W. C. Anderson, the new Ford director in the United Kingdom, has not been long in getting into harness as successor of Sir P. D. Perry at the Ford company's British headquarters, Trafford Park, Manchester. Already rumor is busy about his plans, which chiefly concern a re-grouping of the dealers' rights and privileges, etc.

Hitherto the Ford British trade has been largely centered in a handful of big agents, who have grown prosperous largely at the expense of the many small dealers within the trading radius of each of these "super men." These big dealers parcelled out the larger part of the output here, and distributed it through small dealers. The latter complained that they did the work and reaped much less for it than the big men, who virtually lived in their offices and seldom canvassed an order. Anderson is credited with giving redress to this sort of grievance.

He is credited also with the intention to level up and improve Ford "service" all round, especially on the part of the smaller dealers. Personally, having a long inside knowledge of the trade, I believe that with a betterment of the terms and outlook of the small Ford dealers there will follow automatically betterment of their service, because, as is obvious, catering for "service" largely depends on making it worth the dealer's while, and hitherto the commission to Ford small dealers through the distributers has not warranted the sort of service the Ford Motor Co. wish and is now about to insist upon.

There are other reports prevailing as to the aggressive policy of this company, and personally I should not be surprised to find a direct effort by the company to distribute its cars among mechanics and tradesmen on a deferred payment scheme, for there is no doubt that there are many mechanics in Great Britain who could buy and could maintain a Ford car, if only they could get the nucleus of capital for the purchase.

There are hundreds of mechanics earning from $1,250 to $3,000 a year who in normal times could afford to be Ford owners. This class of business would be done chiefly through the smaller dealer, so that it seems to be the right policy for the Ford interests to help their dealers rather than the hitherto handful of distributing dealers.

RACINE MFG. CO. ADDS

RACINE, WIS., July 21—The Racine Manufacturing Co., maker of car bodies, will spend $50,000 for a 2-story factory addition, 45 x 120 ft., work upon which will begin late in July.

Calendar

SHOWS

Aug. 30-Sept. 6—Minnesota State Fair.

Sept. 1-6 — Indianapolis, Ind. State Fair. Cars and Accessories, Indianapolis Automobile Trade Assn., John B. Orman, Manager.

Sept. 13-20—Cincinnati, O. Ninth Annual, Music Hall. Cincinnati Automobile Dealers' Assn., H. K. Shockley, Manager.

Sept. 15-20—Springfield, Mass. Eastern States Exposition.

Oct. 6-11—Detroit, Mich. Closed Car Show, Arena Gardens. Detroit Auto Dealers' Assn., H. H. Shuart, Mgr.

*Oct. 9-19—Paris. Grand Palais. International Automobile Mfrs. Congress.

Nov. 3-8—Chicago, Ill. Business Exhibit of Automotive equipment Assn., Medinah Temple.

Nov. 7-16—London. Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.

December — Brussels. International Automobile Mfrs. Congress.

January—New York. International Automobile Mfrs. Congress.

Jan. 3-10—New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce, S. A. Miles, Manager.

Jan. 24-31—Chicago, Ill. Coliseum, Cars; Drexel Pavilion, Trucks; National Automobile Chamber of Commerce. S. A. Miles, Manager.

February—Chicago. International Automobile Mfrs. Congress.

Feb. 23-March 6—Birmingham, Eng. British Industries Fair.

AUTOMOTIVE SHOWS AT FAIRS

Aug. 9-16—Sedalia, Mo. Tractors, Missouri State Fair. Kansas City Tractor Club.

Aug. 20-29—Des Moines, Ia. Machinery Hall.

Aug. 26-29—Madison, Wis. Cars, trucks and tractors, accessories, Dane County Fair. Madison Assn. of Commerce.

Aug. 26-29—Columbus, O. Cars and tractors. E. V. Walborn, Manager.

Aug. 31-Sept. 5—Lincoln, Neb. Cars, trucks and tractors. E. R. Danielson, Supt. of Concessions.

Sept. 1-5—Hartford, Conn. Connecticut Fair Assn.

Sept. 1-5—Wheeling, W. Va. Cars, trucks and tractors.

Sept. 1-6—Rochester, N. Y. Automobile Club of Rochester. E. F. Edwards, Manager.

Sept. 1-6—Spokane, Wash. Cars, trucks and tractors.

Sept. 8-13—Helena, Mont. Cars, trucks and tractors.

Sept. 8-13—Milwaukee, Wis. Milwaukee Automobile Dealers, Inc., Bart J. Ruddle, Manager.

Sept. 8-13—Syracuse, N. Y. Cars, trucks and tractors.

Sept. 8-13—Topeka, Kan. Cars, trucks and tractors. Motor Hall and Machinery Field.

Sept. 9-13—Douglas, Wyo. Cars, trucks and tractors.

Sept. 12-20—Peoria, Ill. Cars, trucks and tractors.

Sept. 13-20—Hutchinson, Kan. Cars, trucks and tractors.

Sept. 14-20—Sioux City, Ia. Cars, trucks and tractors.

Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.

Sept. 15-20 — Springfield, Mass. Cars, trucks and tractors. O. A. Nash, Asst. Gen. Manager.

Sept. 15-20—Yakima, Wash. Cars, trucks and tractors.

Sept. 16-19—Billings, Mont. Cars, trucks and tractors.

Sept. 20-27—Oklahoma City, Okla. Cars, trucks and tractors. J. S. Malone, General Manager.

Sept. 20-27—Memphis, Tenn. Cars, trucks and tractors.

Sept. 22-27—Pueblo, Col. Cars, trucks and tractors. J. L. Beaman, Manager.

Sept. 22-27—Salem, Ore. Cars, trucks and tractors. Dealers' Motor Car Assn., M. O. Wilkins, Manager.

Sept. 24-Oct. 4—Kansas City, Kan. Cars, trucks and tractors.

Sept. 29-Oct. 4—Meridian, Miss. Cars and tractors. A. H. George, General Manager.

Sept. 29-Oct. 4 — Chattanooga, Tenn. Chattanooga Auto Dealers' Assn.

Sept. 29-Oct. 4—Muskogee, Okla. Cars, trucks and tractors.

Sept. 30-Oct. 3—Brockton, Mass. Cars.

Sept. 30-Oct. 4—Lancaster, Pa. Lancaster Fair Assn.

October—Columbia, S. C. Columbia Automobile Dealers' Assn.

Oct. 20-25—Raleigh, N. C. Cars, trucks and tractors.

Oct. 22-27—Shreveport, La. Cars, trucks and tractors.

TRACTOR SHOWS

July 28-29—Columbus, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 1-2—Piqua, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 19-21 — Aberdeen, S. D. Tractors, Tractor Accessories and Farm Lighting Plants. Aberdeen Commercial Club.

Sept. 9-12—Streator, Ill. Northern Illinois Tractor & Truck Assn.

Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.

Oct. 14-16—Ottawa, Ont., Can. Interprovincial Plowing Match and Tractor Demonstration.

CONTESTS

*Aug. 15 — Middletown, N. Y. Dirt track event.

*Aug. 22-23—Elgin, Ill. 308 Mile road race.

*Sept. 1—Uniontown, Pa. Speedway race.

*Sept. 13—Sheepshead Bay, L. I. Speedway race.

*Sept. 27—Allentown, Pa. Dirt track event.

*Oct. 1—Cincinnati, O. Speedway race.

*Oct. 4—Trenton, N. J. Dirt track event.

*Oct. 11—Danbury, Conn. Dirt track event.

*Tentative dates.

CONVENTIONS

Sept. 22-24—Philadelphia. Annual Convention, National Association of Purchasing Agents. Bellevue-Stratford.

Oct. 1—Denver, Col. Directors' Meeting, National Automobile Dealers' Assn.

Nov. 3-8—Chicago, Ill. Convention, Automotive Equipment Assn., Medinah Temple.

January, 1920—Washington. Pan-American conference.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

Swedish Demand Heavy For Foreign Cars

WASHINGTON, July 18—A demand for automobiles and motorcycles 300 per cent greater than that in 1914 is reported from Sweden and attributed to the unusual wave of prosperity in that country. Within the past few months, states the Bureau of Foreign and Domestic Commerce, 800 passenger cars have been sold and import applications placed for the same number. However, with the importation of this number it is expected that the Swedish market will be practically closed for some time, as the natives buy cars with the expectation of using them a good many years.

American cars enjoy considerable popularity in Sweden, though there are some complaints that they do not stand up as well as those of European manufacture. The following are some of the American cars used in Sweden: Hudson, Cadillac, Overland, Buick, Ford, Hupmobile, etc.

In the accessory field American products have always played a leading part. There are no figures available as to the amount of this class of goods imported. Normally, however, fully three-fourths of the accessories used in Sweden were American made.

MILTON WINS AT UNIONTOWN

UNIONTOWN, PA., July 19—Without pushing his Duesenberg to limit speed, Tommy Milton won the Independence Derby at the Uniontown Speedway this afternoon. The race was a five heat event of 20 laps, 22½ miles each, with winner of the first heat eliminated from the others and entered in the final. Milton won the first heat at a speed of 99.2 m.p.h., and outstepped the winners of the other three in the fifth, finishing a quarter of a lap ahead of Dave Lewis, who came in for second place in a Meteor.

Milton made the last heat in 13:22.85 at an average of 101.17 m.p.h. His purse for 45 miles of racing was $2,100.

Milton also won the Universal Trophy race in May.

WATSON WAGON NOW PRODUCTS

CANASTOTA, N. Y., July 19—The Watson Wagon Co. has changed its name to the Watson Products Corp.

EDISON OFFICE MOVED

PITTSBURGH, PA., July 18—The Edison Storage Battery Co. has moved its office here to Room 431, Union Arcade Building.

URUGUAYAN STUDIES CARS HERE

NEW YORK, July 21—Mateo A. Frugoni of Montevideo, Uruguay, is in this country to study automobile conditions, especially with a view of traffic in all its ramifications. In his capacity as an investigator, he represents the Automovil Club del Uruguay and the Uruguay government and bears official credentials. Frugoni is this week at Boston and will visit several industrial and tourist centers during his stay in this country.

MATERIAL FOR SALE

WASHINGTON, July 21—Seamless steel tubing, cold rolled sheet steel, welded steel tubing, free cutting brass bars, nickel tubing, forging steel bars and seamless brass tubing are for sale by the Director of Air Service, Material Disposal Section, this city. This material is at Buffalo and is purchasable in varied quantities.

WHITE STOCK TAKEN UP

NEW YORK, July 18—Stockholders have taken up all of the $4,000,000 additional stock authorized by the White Motor Co.